

Engineering Design File

PM-2A Tank Shielding Requirements using MicroShield v. 6.02

Portage Project No.: 2073.00

Project Title: PM-2A Remediation Phase I



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2. Project/Task: PM-2A Remediation Phase 1
3. Subtask: Radiological Shielding
4. Title: PM-2A Tank Shielding Requirements using MicroShield v. 6.02

5. Summary:

This engineering design file evaluates the lead shielding requirements for workers attaching brackets for the removal of the tanks from the ground, removal of sand from the tank cradles, concrete shielding requirements for the tanks after placement in the TAN-607A High Bay, and exposures in the mezzanine area. All exposure and shielding calculations were performed using MicroShield v. 6.02.

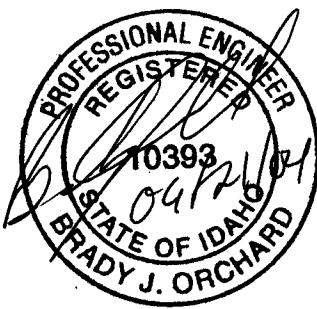
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I. INTRODUCTION AND PURPOSE

This engineering design file (EDF) evaluates the lead shielding requirements for workers welding lifting plates for removing tanks from the ground and removing sand from around the tanks prior to the tank lift, concrete shielding requirements for the tanks after placement in the TAN-607A High Bay, and exposure rates in the mezzanine area. All exposure and shielding calculations were performed using MicroShield v. 6.02 (MicroShield 2003) (see Attachment 1 for output files).

I.1 Radionuclide Inventory Inferred From Exposure Rate Readings

The radionuclide inventories for the PM-2A tanks used in this EDF are based on those used in Bechtel BWXT Idaho, LLC (BBWI) EDF-4718. The radionuclide inventory presented in EDF-4718 was developed from the information in Table B-3 of BBWI EDF-4453. The inventories for the shielding and exposure calculations were adjusted from exposure rate measurements of the tanks after soil was partially removed as shown in Figure 1. The MicroShield tools software provides the capability to infer the isotopic content of a source based on an external exposure rate reading. MicroShield was used to infer the radionuclide inventories based upon the original inventory distributions provided in EDF-4718 and the exposure rate measurements taken around the tanks. The exposure rate reading on the tanks are provided in Figure 2. The exposure rate readings were taken on contact and at 30 cm from the side of the tanks. The highest exposure rates at 30 cm for each tank (i.e., 90 mR/hr for V-13 and 38 mR/hr for V-14) were used to infer the radionuclide inventories for each tank. Contact readings were not used since the point kernel model in MicroShield is considered to be very approximate for close distances from the source. The adjusted tank inventories based on exposure rate measurements are provided in Tables 1 and 2.

I.2 Material and Geometry Assumptions

The sludge and other material in the tanks were modeled as a uniformly mixed, rectangular volume source with an estimated 6 in. of uniform dense material that is 3 ft in width and 50 ft in length for Tank V-14, and 12 in. of uniform dense material that is 3 ft in width and 50 ft in length for Tank V-13. The radionuclides are assumed to be uniformly distributed throughout the volume of the waste material in each tank. These geometries and assumptions are the same as those used in EDF-4718.

The source material density of 1.0098 g/cm³ was derived from EDF-4453 according to EDF-4718, with the density calculated from a weighted average of the densities of the sludge material, water, and diatomaceous earth.

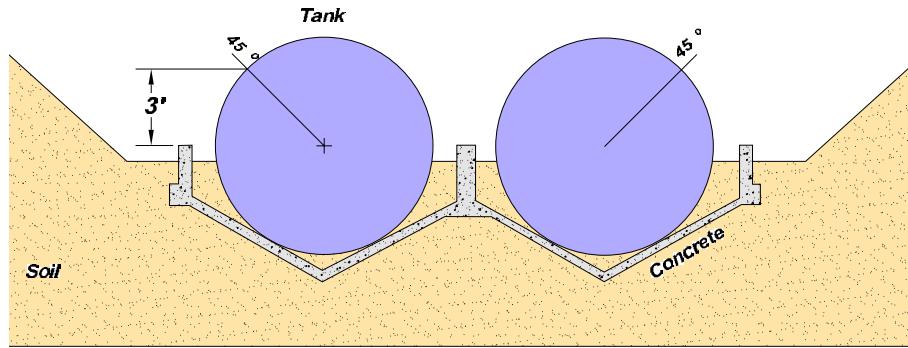


Figure 1. Conceptualization of tank removal geometries.

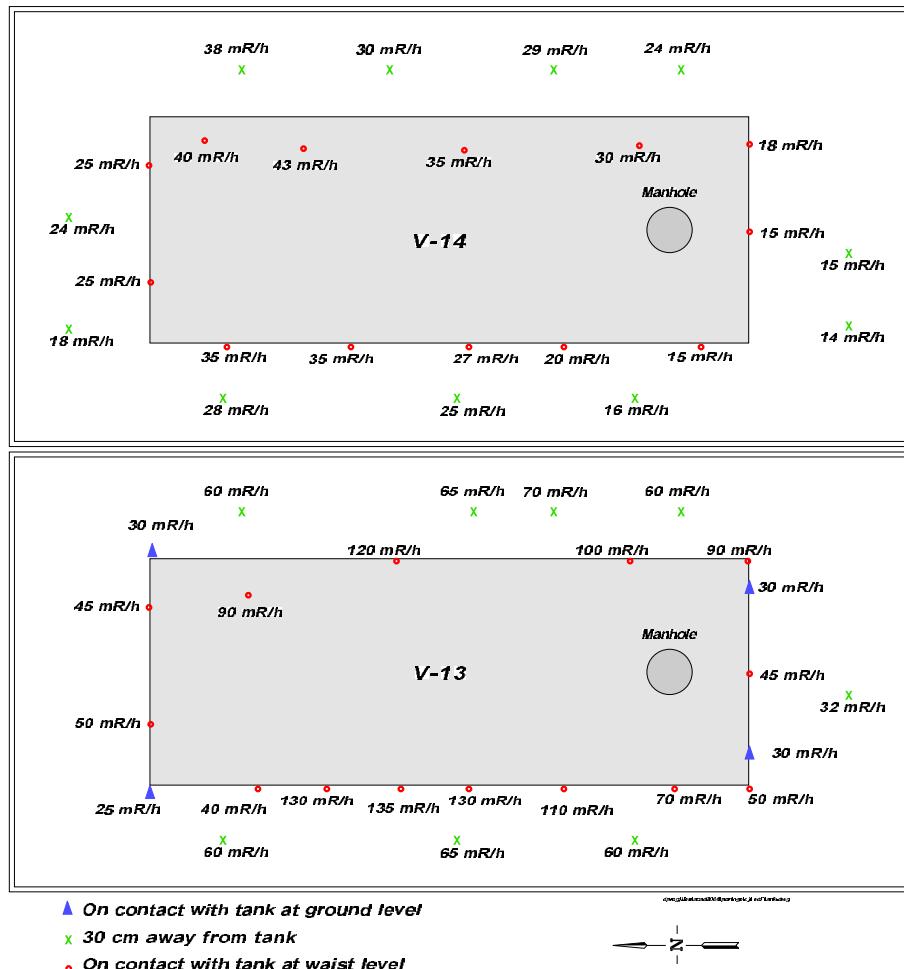


Figure 2. Exposure rate measurements on side of tanks (aerial view).

Table 1. Radionuclide inventory inferred from exposure rate measurements for Tank V-13.

Nuclide	Original Inventory (EDF-4718) (Ci)	Inferred Inventory (Ci)
Ag-108	8.4E-04	1.4E-03
Am-241	2.4E-03	4.0E-03
Am-243	6.8E-06	1.1E-05
Ba-137m	1.8E+01	3.0E+01
C-14	1.6E-04	2.7E-04
Cm-243	2.1E-04	3.5E-04
Cm-244	2.1E-04	3.5E-04
Co-60	8.9E-02	1.5E-01
Cs-137	1.9E+01	3.2E+01
Fe-155	2.8E-03	4.6E-03
H-3	1.4E-01	2.3E-01
Ni-59	2.9E-02	4.8E-02
Ni-63	3.0	5.1
Np-237	2.3E-05	3.9E-05
Pu-238	1.3E-02	2.2E-02
Pu-239	9.5E-03	1.6E-02
Pu-240	9.5E-03	1.6E-02
Pu-241	1.2E-02	2.1E-02
Sr-90	2.0E+01	3.3E+01
Tc-99	1.5E-03	2.5E-03
U-233	5.0E-05	8.4E-05
U-234	7.8E-03	1.3E-02
U-235	2.5E-04	4.2E-04
U-236	3.2E-05	5.3E-05
U-238	5.4E-05	9.1E-05
Y-90	2.0E+01	3.3E+01

Table 2. Radionuclide inventory inferred from exposure rate measurements for Tank V-14.

Nuclide	Original Inventory (EDF-4718) (Ci)	Inferred Inventory (Ci)
Am-241	1.9E-03	8.5E-04
Ba-137m	1.9E+01	8.7
C-14	2.1E-04	9.6E-05
Cm-243	9.9E-05	4.5E-05
Cm-244	9.9E-05	4.5E-05
Co-60	9.2E-02	4.2E-02
Cs-137	2.0E+01	9.2
Fe-155	1.7E-03	9.0E-04
H-3	1.4E-02	6.4E-03
Ni-59	3.4E-02	1.6E-02
Ni-63	3.3	1.5
Pu-238	8.2E-03	3.7E-03
Pu-239	7.1E-03	3.2E-03
Pu-240	7.1E-03	3.2E-03
Pu-241	8.6E-03	4.0E-03
Sr-90	1.7E+01	7.7
Tc-99	2.2E-03	12.0E-03
U-233	4.5E-05	2.1E-05
U-234	1.5E-02	6.9E-03
U-235	5.0E-05	2.3E-04
U-236	9.5E-05	4.4E-05
U-238	1.8E-04	8.1E-05
Y-90	1.7E+01	7.7

2. LEAD SHIELDING REQUIREMENTS

The lead shielding requirements were evaluated for workers welding lifting plates to the tanks. The tanks will be partially excavated as shown in Figure 1. The lead shielding requirements were evaluated for the location at 45 degrees from the upper quadrant of the tanks. Specific shielding requirements for workers removing sand from the tank cradles were

not evaluated because sand removal can be accomplished with the workers at a distance from the tanks and for a shorter period of time than the welding operation.

The lead shielding was evaluated in terms of the number of 4-mm (0.157-in.) lead blankets (10 lb/ft²), which are commercially available. The number of lead blankets required to reduce the exposure rate to 0.5 mR/hr was evaluated for a location of 2 in. from the shielding. The results of the analysis are provided in Table 3.

Table 3. Lead shielding requirements for outside surface of each tank.

Tank	MicroShield File Name	Number of 4-mm Lead Blankets	Exposure Rate (mR/hr) at 2 in.
V-13	V13 lead 5.ms6	5	0.52
	V13 lead 6.ms6	6	0.22
V-14	V14 lead 3.ms6	3	1.1
	V14 lead 3.ms6	4	0.42

The results of the lead shielding analysis indicates that five 4-mm lead blankets would be required for Tank V-13 and four 4-mm lead blankets are required for Tank V-14 to reduce the exposure rate at 2 in. from the lead shield below the exposure limit of 0.5 mR/hr for workers located on the outside of the tanks.

Workers will also be working in the area between the two tanks. This situation results in exposures from both tanks on each side of the worker. The lead shielding required was based on reducing the exposure rate to 3 mR/hr from the entire system for the worker located at the centerline between the tanks. Therefore, the worker was allowed exposures of 1.5 mR/hr from each tank while located along the centerline of the tanks. The lead requirements for this exposure scenario are presented in Table 4.

Table 4. Lead shielding requirements for centerline between tanks.

Tank	MicroShield File Name	Number of 4-mm Lead Blankets	Exposure Rate (mR/hr) at 2 in.
V-13	V13 lead 9.ms6	9	2.0
	V13 lead 10.ms6	10	1.3
V-14	V14 lead 7.ms6	7	2.3
	V14 lead 8.ms6	8	1.4

The data presented in Table 4 indicate that nine 4-mm lead blankets would be required for Tank V-13 and 8-lead blanket are required for Tank V-14 to reduce the worker exposures to 3 mR/hr at the centerline of the tanks.

3. CONCRETE SHIELDING REQUIREMENTS

Concrete shielding requirements were evaluated for the tanks once they are placed in the TAN-607A High Bay. The concrete shielding will consist of 14 in. of concrete. The exposure rates for 14 in. of concrete were evaluated at the distance of 2 in. from the shielding. The exposure rate goal for this exposure location is less than 0.5 mR/hr. The exposure rates were evaluated at the centerlines of the side of the tanks for conservatism. The exposure rates near the end of the tanks are typically lower due to geometry factors. The results of the analysis are provided in Table 5 for the concrete shielding located 12 ft from the centerline of the tanks, where the outside of the concrete shields will be located.

Table 5. Concrete shielding requirements for 12-ft centerline geometry.

Tank	MicroShield File Name	Concrete (in.)	Exposure Rate (mR/hr) at 2 in. from Shield
V-13	V13 concrete 14.ms6	14	0.43
V-14	V14 concrete 14.ms6	14	0.07

The results of the concrete shielding analysis indicate that 14 in. of concrete shielding would be required to reduce the exposure rate at 2 in. from the concrete shielding wall to the specified exposure limit of 0.5 mR/hr. See Attachment 2 for the concrete radiation barrier wall drawings.

4. EXPOSURE RATES FOR MEZZANINE IN TAN-607A HIGH BAY

The exposure rates from Tank V-13 in the mezzanine area of TAN-607A High Bay were evaluated. Tank V-13 was modeled with the adjusted source based on the exposure rate measurements presented in Section 1.1. The exposure rates were evaluated for a non-shielded geometry. The mezzanine was located from the centerline of the tank side, 25 ft high from ground level, and 30 ft horizontally away from the tank. The resulting exposure rate was determined to be 25 mR/hr at the mezzanine location.

5. SUMMARY

Modeling of the exposure rates from the PM-2A tanks (V-13 and V-14) demonstrates that shielding will be necessary to limit personnel exposure during the welding of lifting plates and sand removal from the tank cradles, and during tank storage in the TAN-607A High Bay. Lead blankets will provide effective, portable personnel shielding during tank removal activities and concrete panels will be used in the TAN-607A High Bay to allow unrestricted occupancy per 10 CFR 835.1002, "Facility Design and Modifications." After placement of shielding, exposure rates will be measured with field instruments prior to work to ensure acceptable exposure levels for personnel performing tank-related tasks.

5. REFERENCES

10 CFR 835.1002, 2004, "Facility Design and Modifications," *Code of Federal Regulations*, Office of the Federal Register, January 1, 2004.

EDF-4453, 2004, "Hazard Assessment Calculation for Hazard Classification for PM-2A Tanks (V13 and V-14)," 2004.

EDF-4718, 2003, "Exposure Rate Estimates for Excavation, Extraction, Transportation, Treatment, Sampling and Storage of the TAN PM-2A Waste Tanks," 2003.

MicroShield, Version 6.02, Onley, Maryland: Grove Engineering, 2003.

Attachment I

MicroShield Output Files

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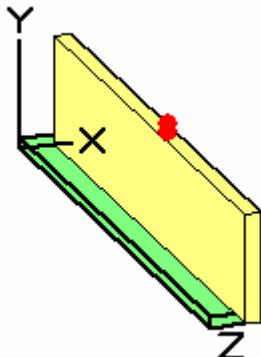
Case Title: PM2A Tanks
Description: V13 - 5 blankets lead shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	101.6 cm	(3 ft 4.0 in)
Width	1.5e+3 cm	(50 ft)
Height	30.48 cm	(1 ft)

Dose Points

A	X	Y	Z
# 1	1.54e+02 cm 5 ft 0.5 in	289.56 cm 9 ft 6.0 in	762 cm 25 ft
# 2	1.54e+02 cm 5 ft 0.5 in	317.5 cm 10 ft 5.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	2.88e+05 in ³	V123 SLUDGE	1.02
Shield 1	17.2 in	Air	0.00122
Shield 2	.562 in	Iron	7.86
Shield 3	.785 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Ag-108m	1.4116e-003	5.2229e+007	2.9910e-004	1.1067e+001
Am-241	3.9973e-003	1.4790e+008	8.4697e-004	3.1338e+001
Am-243	1.1323e-005	4.1894e+005	2.3992e-006	8.8769e-002
Ba-137m	2.9903e+001	1.1064e+012	6.3361e+000	2.3444e+005
C-14	2.6593e-004	9.8393e+006	5.6347e-005	2.0848e+000
Cm-243	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Cm-244	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Co-60	1.4902e-001	5.5137e+009	3.1575e-002	1.1683e+003
Cs-137	3.1610e+001	1.1696e+012	6.6978e+000	2.4782e+005
Fe-55	4.6495e-003	1.7203e+008	9.8518e-004	3.6452e+001
H-3	2.3248e-001	8.6017e+009	4.9259e-002	1.8226e+003
Ni-59	4.8001e-002	1.7760e+009	1.0171e-002	3.7632e+002
Ni-63	5.1011e+000	1.8874e+011	1.0809e+000	3.9992e+004
Np-237	3.8969e-005	1.4419e+006	8.2571e-006	3.0551e-001
Pu-238	2.2077e-002	8.1685e+008	4.6778e-003	1.7308e+002
Pu-239	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-240	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-241	2.0572e-002	7.6115e+008	4.3589e-003	1.6128e+002
Sr-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005
Tc-99	2.5422e-003	9.4061e+007	5.3866e-004	1.9930e+001
U-233	8.3959e-005	3.1065e+006	1.7790e-005	6.5823e-001
U-234	1.3112e-002	4.8516e+008	2.7784e-003	1.0280e+002
U-235	4.1812e-004	1.5471e+007	8.8596e-005	3.2780e+000
U-236	5.3353e-005	1.9740e+006	1.1305e-005	4.1828e-001
U-238	9.1151e-005	3.3726e+006	1.9314e-005	7.1461e-001
Y-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (60.5475,114,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.304e-24	0.000e+00	1.118e-25
0.02	3.426e+07	0.000e+00	1.017e-26	0.000e+00	3.523e-28
0.03	6.517e+10	0.000e+00	3.668e-22	0.000e+00	3.635e-24
0.04	1.538e+10	1.069e-297	7.641e-22	4.728e-300	3.379e-24
0.05	8.827e+05	1.717e-168	3.981e-25	4.575e-171	1.061e-27
0.06	5.380e+07	5.484e-104	1.199e-22	1.089e-106	2.382e-25
0.08	4.603e+06	7.079e-52	5.693e-23	1.120e-54	9.009e-26
0.1	8.086e+06	2.654e-112	7.843e-23	4.061e-115	1.200e-25
0.15	2.454e+06	5.338e-44	1.044e-22	8.791e-47	1.719e-25
0.2	1.135e+07	2.348e-23	4.275e-19	4.144e-26	7.545e-22
0.3	1.915e+06	4.576e-12	3.426e-09	8.680e-15	6.498e-12
0.4	4.694e+07	5.722e-07	9.330e-05	1.115e-09	1.818e-07
0.6	9.956e+11	4.976e+00	1.990e+02	9.713e-03	3.883e-01
0.8	4.727e+07	2.643e-03	5.369e-02	5.027e-06	1.021e-04
1.0	5.514e+09	1.238e+00	1.659e+01	2.281e-03	3.058e-02
1.5	5.514e+09	7.891e+00	5.945e+01	1.328e-02	1.000e-01
Totals	1.100e+12	1.411e+01	2.750e+02	2.528e-02	5.190e-01

Results - Dose Point # 2 - (60.5475,125,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.167e-24	0.000e+00	1.001e-25
0.02	3.426e+07	0.000e+00	9.103e-27	0.000e+00	3.153e-28
0.03	6.517e+10	0.000e+00	3.283e-22	0.000e+00	3.253e-24
0.04	1.538e+10	0.000e+00	6.840e-22	0.000e+00	3.025e-24
0.05	8.827e+05	1.145e-181	3.564e-25	3.049e-184	9.494e-28
0.06	5.380e+07	4.255e-112	1.073e-22	8.452e-115	2.132e-25
0.08	4.603e+06	1.001e-55	5.096e-23	1.584e-58	8.064e-26
0.1	8.086e+06	4.808e-121	7.020e-23	7.356e-124	1.074e-25
0.15	2.454e+06	3.124e-47	9.341e-23	5.145e-50	1.538e-25
0.2	1.135e+07	4.959e-25	1.164e-20	8.752e-28	2.055e-23
0.3	1.915e+06	7.884e-13	7.087e-10	1.496e-15	1.344e-12
0.4	4.694e+07	1.812e-07	3.413e-05	3.531e-10	6.650e-08
0.6	9.956e+11	2.341e+00	1.043e+02	4.569e-03	2.035e-01
0.8	4.727e+07	1.433e-03	3.182e-02	2.726e-06	6.053e-05
1.0	5.514e+09	7.232e-01	1.048e+01	1.333e-03	1.931e-02
1.5	5.514e+09	5.036e+00	4.034e+01	8.473e-03	6.786e-02
Totals	1.100e+12	8.102e+00	1.551e+02	1.438e-02	2.908e-01

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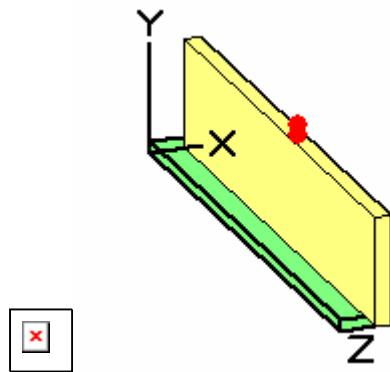
Case Title: PM2A Tanks
Description: V13 - 6 blankets of lead shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	101.6 cm	(3 ft 4.0 in)
Width	1.5e+3 cm	(50 ft)
Height	30.48 cm	(1 ft)

Dose Points

A	X	Y	Z
# 1	1.54e+02 cm 5 ft 0.7 in	289.56 cm 9 ft 6.0 in	762 cm 25 ft
# 2	1.54e+02 cm 5 ft 0.7 in	317.5 cm 10 ft 5.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	2.88e+05 in ³	V123 SLUDGE	1.02
Shield 1	17.2 in	Air	0.00122
Shield 2	.562 in	Iron	7.86
Shield 3	.942 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Ag-108m	1.4116e-003	5.2229e+007	2.9910e-004	1.1067e+001
Am-241	3.9973e-003	1.4790e+008	8.4697e-004	3.1338e+001
Am-243	1.1323e-005	4.1894e+005	2.3992e-006	8.8769e-002
Ba-137m	2.9903e+001	1.1064e+012	6.3361e+000	2.3444e+005

C-14	2.6593e-004	9.8393e+006	5.6347e-005	2.0848e+000
Cm-243	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Cm-244	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Co-60	1.4902e-001	5.5137e+009	3.1575e-002	1.1683e+003
Cs-137	3.1610e+001	1.1696e+012	6.6978e+000	2.4782e+005
Fe-55	4.6495e-003	1.7203e+008	9.8518e-004	3.6452e+001
H-3	2.3248e-001	8.6017e+009	4.9259e-002	1.8226e+003
Ni-59	4.8001e-002	1.7760e+009	1.0171e-002	3.7632e+002
Ni-63	5.1011e+000	1.8874e+011	1.0809e+000	3.9992e+004
Np-237	3.8969e-005	1.4419e+006	8.2571e-006	3.0551e-001
Pu-238	2.2077e-002	8.1685e+008	4.6778e-003	1.7308e+002
Pu-239	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-240	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-241	2.0572e-002	7.6115e+008	4.3589e-003	1.6128e+002
Sr-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005
Tc-99	2.5422e-003	9.4061e+007	5.3866e-004	1.9930e+001
U-233	8.3959e-005	3.1065e+006	1.7790e-005	6.5823e-001
U-234	1.3112e-002	4.8516e+008	2.7784e-003	1.0280e+002
U-235	4.1812e-004	1.5471e+007	8.8596e-005	3.2780e+000
U-236	5.3353e-005	1.9740e+006	1.1305e-005	4.1828e-001
U-238	9.1151e-005	3.3726e+006	1.9314e-005	7.1461e-001
Y-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (60.7045,114,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.303e-24	0.000e+00	1.118e-25
0.02	3.426e+07	0.000e+00	1.016e-26	0.000e+00	3.521e-28
0.03	6.517e+10	0.000e+00	3.665e-22	0.000e+00	3.633e-24
0.04	1.538e+10	0.000e+00	7.637e-22	0.000e+00	3.377e-24
0.05	8.827e+05	6.030e-197	3.979e-25	1.606e-199	1.060e-27
0.06	5.380e+07	1.674e-121	1.198e-22	3.325e-124	2.380e-25
0.08	4.603e+06	3.922e-60	5.689e-23	6.207e-63	9.003e-26
0.1	8.086e+06	7.078e-133	7.838e-23	1.083e-135	1.199e-25
0.15	2.454e+06	1.844e-51	1.043e-22	3.037e-54	1.718e-25
0.2	1.135e+07	4.449e-27	4.355e-22	7.852e-30	7.686e-25
0.3	1.915e+06	1.302e-13	1.422e-10	2.470e-16	2.698e-13
0.4	4.694e+07	6.857e-08	1.483e-05	1.336e-10	2.890e-08

0.6	9.956e+11	1.482e+00	7.200e+01	2.893e-03	1.405e-01
0.8	4.727e+07	1.073e-03	2.539e-02	2.040e-06	4.830e-05
1.0	5.514e+09	5.861e-01	8.947e+00	1.080e-03	1.649e-02
1.5	5.514e+09	4.414e+00	3.675e+01	7.426e-03	6.182e-02
Totals	1.100e+12	6.483e+00	1.177e+02	1.140e-02	2.189e-01

Results - Dose Point # 2 - (60.7045,125,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.166e-24	0.000e+00	1.000e-25
0.02	3.426e+07	0.000e+00	9.098e-27	0.000e+00	3.151e-28
0.03	6.517e+10	0.000e+00	3.281e-22	0.000e+00	3.252e-24
0.04	1.538e+10	0.000e+00	6.836e-22	0.000e+00	3.023e-24
0.05	8.827e+05	2.091e-212	3.562e-25	5.570e-215	9.489e-28
0.06	5.380e+07	5.111e-131	1.073e-22	1.015e-133	2.131e-25
0.08	4.603e+06	1.233e-64	5.093e-23	1.952e-67	8.059e-26
0.1	8.086e+06	2.863e-143	7.017e-23	4.380e-146	1.073e-25
0.15	2.454e+06	2.794e-55	9.337e-23	4.602e-58	1.537e-25
0.2	1.135e+07	4.837e-29	2.793e-22	8.537e-32	4.930e-25
0.3	1.915e+06	1.717e-14	2.263e-11	3.257e-17	4.292e-14
0.4	4.694e+07	1.859e-08	4.675e-06	3.622e-11	9.108e-09
0.6	9.956e+11	6.400e-01	3.479e+01	1.249e-03	6.790e-02
0.8	4.727e+07	5.464e-04	1.419e-02	1.039e-06	2.700e-05
1.0	5.514e+09	3.255e-01	5.387e+00	6.000e-04	9.931e-03
1.5	5.514e+09	2.710e+00	2.405e+01	4.559e-03	4.046e-02
Totals	1.100e+12	3.676e+00	6.424e+01	6.409e-03	1.183e-01

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File Ref :

DOS File :v14 lead 3.ms6

Date :

Run Date : June 9, 2004

By :

Run Time : 12:49:50 PM

Checked :

Duration : 00:00:05

Case Title: PM2A Tanks

Description: V14 - 3 blankets lead shielding

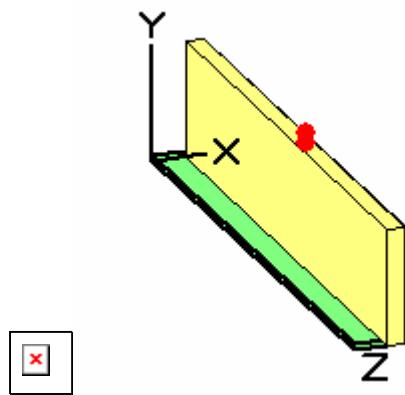
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	91.44 cm	(3 ft)
Width	1.5e+3 cm	(50 ft)
Height	15.24 cm	(6.0 in)

Dose Points

A	X	Y	Z
# 1	1.48e+02 cm 4 ft 10.2 in	289.56 cm 9 ft 6.0 in	762 cm 25 ft
# 2	1.48e+02 cm 4 ft 10.2 in	317.5 cm 10 ft 5.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	1.30e+05 in ³	V123 SLUDGE	1.02
Shield 1	19.2 in	Air	0.00122
Shield 2	.563 in	Iron	7.86
Shield 3	.471 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Am-241	8.5164e-004	3.1511e+007	4.0101e-004	1.4837e+001
Ba-137m	8.7063e+000	3.2213e+011	4.0995e+000	1.5168e+005
C-14	9.6153e-005	3.5577e+006	4.5275e-005	1.6752e+000
Cm-243	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Cm-244	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Co-60	4.1987e-002	1.5535e+009	1.9770e-002	7.3149e+002
Cs-137	9.2033e+000	3.4052e+011	4.3335e+000	1.6034e+005
Fe-55	7.9670e-004	2.9478e+007	3.7514e-004	1.3880e+001
H-3	6.4102e-003	2.3718e+008	3.0183e-003	1.1168e+002
Ni-59	1.5568e-002	5.7600e+008	7.3302e-003	2.7122e+002
Ni-63	1.5201e+000	5.6245e+010	7.1578e-001	2.6484e+004
Pu-238	3.7317e-003	1.3807e+008	1.7571e-003	6.5013e+001

Pu-239	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-240	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-241	3.9606e-003	1.4654e+008	1.8649e-003	6.9001e+001
Sr-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005
Tc-99	1.0302e-003	3.8118e+007	4.8509e-004	1.7948e+001
U-233	2.0559e-005	7.6067e+005	9.6802e-006	3.5817e-001
U-234	6.8681e-003	2.5412e+008	3.2339e-003	1.1966e+002
U-235	2.2848e-004	8.4537e+006	1.0758e-004	3.9805e+000
U-236	4.3635e-005	1.6145e+006	2.0546e-005	7.6021e-001
U-238	8.1044e-005	2.9986e+006	3.8160e-005	1.4119e+000
Y-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (58.2335,114,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.685e-25	0.000e+00	3.161e-26
0.03	1.897e+10	0.000e+00	1.037e-22	0.000e+00	1.027e-24
0.04	4.478e+09	1.170e-207	2.160e-22	5.177e-210	9.552e-25
0.05	3.626e+05	8.846e-119	1.588e-25	2.356e-121	4.230e-28
0.06	1.144e+07	1.145e-73	2.476e-23	2.275e-76	4.919e-26
0.08	2.402e+05	2.273e-38	2.884e-24	3.596e-41	4.564e-27
0.1	1.658e+06	6.072e-76	1.561e-23	9.289e-79	2.388e-26
0.15	1.309e+06	1.224e-30	5.405e-23	2.015e-33	8.900e-26
0.2	5.448e+06	9.734e-17	5.259e-13	1.718e-19	9.282e-16
0.3	2.473e+05	6.095e-10	1.997e-07	1.156e-12	3.789e-10
0.6	2.899e+11	2.016e+01	5.217e+02	3.936e-02	1.018e+00
1.0	1.554e+09	1.995e+00	1.966e+01	3.678e-03	3.625e-02
1.5	1.554e+09	9.046e+00	5.323e+01	1.522e-02	8.956e-02
Totals	3.201e+11	3.120e+01	5.946e+02	5.825e-02	1.144e+00

Results - Dose Point # 2 - (58.2335,125,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.304e-25	0.000e+00	2.834e-26
0.03	1.897e+10	0.000e+00	9.293e-23	0.000e+00	9.209e-25
0.04	4.478e+09	4.363e-224	1.936e-22	1.929e-226	8.563e-25
0.05	3.626e+05	8.497e-128	1.423e-25	2.264e-130	3.792e-28
0.06	1.144e+07	3.191e-79	2.220e-23	6.338e-82	4.409e-26

0.08	2.402e+05	4.918e-41	2.585e-24	7.783e-44	4.091e-27
0.1	1.658e+06	1.223e-81	1.400e-23	1.872e-84	2.141e-26
0.15	1.309e+06	8.633e-33	4.845e-23	1.422e-35	7.979e-26
0.2	5.448e+06	7.009e-18	4.760e-14	1.237e-20	8.402e-17
0.3	2.473e+05	1.717e-10	6.638e-08	3.257e-13	1.259e-10
0.6	2.899e+11	1.107e+01	3.162e+02	2.161e-02	6.173e-01
1.0	1.554e+09	1.278e+00	1.355e+01	2.355e-03	2.497e-02
1.5	1.554e+09	6.192e+00	3.863e+01	1.042e-02	6.499e-02
Totals	3.201e+11	1.854e+01	3.684e+02	3.438e-02	7.072e-01

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Run Time : 12:51:24 PM
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Date :
By :
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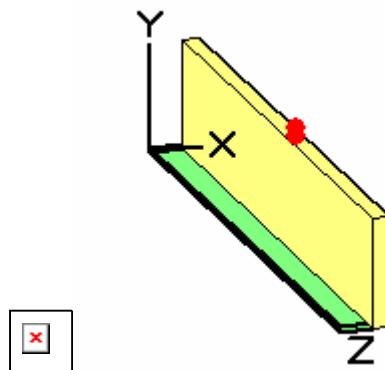
Case Title: PM2A Tanks
Description: V14 - 4 blankets lead shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	91.44 cm	(3 ft)
Width	1.5e+3 cm	(50 ft)
Height	15.24 cm	(6.0 in)

Dose Points

A	X	Y	Z
# 1	1.48e+02 cm 4 ft 10.4 in	289.56 cm 9 ft 6.0 in	762 cm 25 ft
# 2	1.48e+02 cm 4 ft 10.4 in	317.5 cm 10 ft 5.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	1.30e+05 in ³	V123 SLUDGE	1.02
Shield 1	19.2 in	Air	0.00122
Shield 2	.563 in	Iron	7.86
Shield 3	.628 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Am-241	8.5164e-004	3.1511e+007	4.0101e-004	1.4837e+001
Ba-137m	8.7063e+000	3.2213e+011	4.0995e+000	1.5168e+005
C-14	9.6153e-005	3.5577e+006	4.5275e-005	1.6752e+000
Cm-243	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Cm-244	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Co-60	4.1987e-002	1.5535e+009	1.9770e-002	7.3149e+002
Cs-137	9.2033e+000	3.4052e+011	4.3335e+000	1.6034e+005
Fe-55	7.9670e-004	2.9478e+007	3.7514e-004	1.3880e+001
H-3	6.4102e-003	2.3718e+008	3.0183e-003	1.1168e+002
Ni-59	1.5568e-002	5.7600e+008	7.3302e-003	2.7122e+002
Ni-63	1.5201e+000	5.6245e+010	7.1578e-001	2.6484e+004
Pu-238	3.7317e-003	1.3807e+008	1.7571e-003	6.5013e+001
Pu-239	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-240	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-241	3.9606e-003	1.4654e+008	1.8649e-003	6.9001e+001
Sr-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005
Tc-99	1.0302e-003	3.8118e+007	4.8509e-004	1.7948e+001
U-233	2.0559e-005	7.6067e+005	9.6802e-006	3.5817e-001
U-234	6.8681e-003	2.5412e+008	3.2339e-003	1.1966e+002
U-235	2.2848e-004	8.4537e+006	1.0758e-004	3.9805e+000
U-236	4.3635e-005	1.6145e+006	2.0546e-005	7.6021e-001
U-238	8.1044e-005	2.9986e+006	3.8160e-005	1.4119e+000
Y-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (58.3905,114,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.683e-25	0.000e+00	3.159e-26
0.03	1.897e+10	0.000e+00	1.036e-22	0.000e+00	1.027e-24
0.04	4.478e+09	2.208e-263	2.158e-22	9.763e-266	9.546e-25
0.05	3.626e+05	1.673e-149	1.587e-25	4.458e-152	4.228e-28

0.06	1.144e+07	1.320e-92	2.475e-23	2.622e-95	4.916e-26
0.08	2.402e+05	2.529e-47	2.882e-24	4.002e-50	4.561e-27
0.1	1.658e+06	3.381e-98	1.560e-23	5.173e-101	2.387e-26
0.15	1.309e+06	9.572e-39	5.402e-23	1.576e-41	8.895e-26
0.2	5.448e+06	8.420e-21	1.002e-16	1.486e-23	1.769e-19
0.3	2.473e+05	1.218e-11	6.737e-09	2.311e-14	1.278e-11
0.6	2.899e+11	5.264e+00	1.761e+02	1.027e-02	3.437e-01
1.0	1.554e+09	8.697e-01	1.016e+01	1.603e-03	1.872e-02
1.5	1.554e+09	4.742e+00	3.179e+01	7.978e-03	5.348e-02
Totals	3.201e+11	1.088e+01	2.180e+02	1.986e-02	4.159e-01

Results - Dose Point # 2 - (58.3905,125,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.302e-25	0.000e+00	2.832e-26
0.03	1.897e+10	0.000e+00	9.288e-23	0.000e+00	9.205e-25
0.04	4.478e+09	3.078e-284	1.935e-22	1.362e-286	8.558e-25
0.05	3.626e+05	5.829e-161	1.423e-25	1.553e-163	3.790e-28
0.06	1.144e+07	1.169e-99	2.219e-23	2.322e-102	4.407e-26
0.08	2.402e+05	1.105e-50	2.584e-24	1.749e-53	4.089e-27
0.1	1.658e+06	1.182e-105	1.399e-23	1.808e-108	2.140e-26
0.15	1.309e+06	1.597e-41	4.843e-23	2.630e-44	7.975e-26
0.2	5.448e+06	2.978e-22	4.500e-18	5.256e-25	7.943e-21
0.3	2.473e+05	2.578e-12	1.699e-09	4.890e-15	3.224e-12
0.6	2.899e+11	2.636e+00	9.799e+01	5.145e-03	1.913e-01
1.0	1.554e+09	5.269e-01	6.648e+00	9.712e-04	1.225e-02
1.5	1.554e+09	3.111e+00	2.218e+01	5.233e-03	3.731e-02
Totals	3.201e+11	6.273e+00	1.268e+02	1.135e-02	2.408e-01

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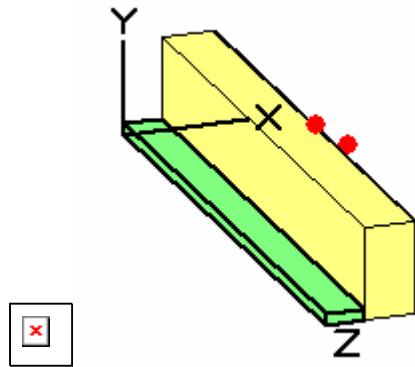
Case Title: PM2A Tanks
Description: V13 - 9 blankets lead shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	101.6 cm	(3 ft 4.0 in)
Width	1.5e+3 cm	(50 ft)
Height	30.48 cm	(1 ft)

Dose Points

A	X	Y	Z
# 1	2.51e+02 cm	190.5 cm	762 cm
	8 ft 3.0 in	6 ft 3.0 in	25 ft
# 2	3.38e+02 cm	190.5 cm	762 cm
	11 ft 1.0 in	6 ft 3.0 in	25 ft
# 3	2.51e+02 cm	254 cm	762 cm
	8 ft 3.0 in	8 ft 4.0 in	25 ft



Shields

Shield N	Dimension	Material	Density
Source	2.88e+05 in ³	V123 SLUDGE	1.02
Shield 1	55.0 in	Air	0.00122
Shield 2	.563 in	Iron	7.86
Shield 3	1.413 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Ag-108m	1.4116e-003	5.2229e+007	2.9910e-004	1.1067e+001
Am-241	3.9973e-003	1.4790e+008	8.4697e-004	3.1338e+001
Am-243	1.1323e-005	4.1894e+005	2.3992e-006	8.8769e-002
Ba-137m	2.9903e+001	1.1064e+012	6.3361e+000	2.3444e+005
C-14	2.6593e-004	9.8393e+006	5.6347e-005	2.0848e+000
Cm-243	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Cm-244	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Co-60	1.4902e-001	5.5137e+009	3.1575e-002	1.1683e+003
Cs-137	3.1610e+001	1.1696e+012	6.6978e+000	2.4782e+005
Fe-55	4.6495e-003	1.7203e+008	9.8518e-004	3.6452e+001
H-3	2.3248e-001	8.6017e+009	4.9259e-002	1.8226e+003

Ni-59	4.8001e-002	1.7760e+009	1.0171e-002	3.7632e+002
Ni-63	5.1011e+000	1.8874e+011	1.0809e+000	3.9992e+004
Np-237	3.8969e-005	1.4419e+006	8.2571e-006	3.0551e-001
Pu-238	2.2077e-002	8.1685e+008	4.6778e-003	1.7308e+002
Pu-239	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-240	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-241	2.0572e-002	7.6115e+008	4.3589e-003	1.6128e+002
Sr-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005
Tc-99	2.5422e-003	9.4061e+007	5.3866e-004	1.9930e+001
U-233	8.3959e-005	3.1065e+006	1.7790e-005	6.5823e-001
U-234	1.3112e-002	4.8516e+008	2.7784e-003	1.0280e+002
U-235	4.1812e-004	1.5471e+007	8.8596e-005	3.2780e+000
U-236	5.3353e-005	1.9740e+006	1.1305e-005	4.1828e-001
U-238	9.1151e-005	3.3726e+006	1.9314e-005	7.1461e-001
Y-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (98.9756,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.484e-24	0.000e+00	1.273e-25
0.02	3.426e+07	0.000e+00	1.157e-26	0.000e+00	4.009e-28
0.03	6.517e+10	0.000e+00	4.174e-22	0.000e+00	4.136e-24
0.04	1.538e+10	3.032e-306	8.696e-22	1.341e-308	3.846e-24
0.05	8.827e+05	2.354e-173	4.531e-25	6.271e-176	1.207e-27
0.06	5.380e+07	7.013e-107	1.365e-22	1.393e-109	2.711e-25
0.08	4.603e+06	6.722e-53	6.478e-23	1.064e-55	1.025e-25
0.1	8.086e+06	1.749e-119	8.925e-23	2.676e-122	1.365e-25
0.15	2.454e+06	4.751e-46	1.188e-22	7.823e-49	1.956e-25
0.2	1.135e+07	6.085e-24	1.305e-19	1.074e-26	2.304e-22
0.3	1.915e+06	7.564e-12	6.028e-09	1.435e-14	1.144e-11
0.4	4.694e+07	1.502e-06	2.440e-04	2.927e-09	4.754e-07
0.6	9.956e+11	1.584e+01	5.886e+02	3.091e-02	1.149e+00
0.8	4.727e+07	8.384e-03	1.541e-01	1.595e-05	2.932e-04
1.0	5.514e+09	3.789e+00	4.542e+01	6.984e-03	8.372e-02
1.5	5.514e+09	2.200e+01	1.481e+02	3.701e-02	2.492e-01
Totals	1.100e+12	4.163e+01	7.823e+02	7.493e-02	1.482e+00

Results - Dose Point # 2 - (132.9756,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.100e-24	0.000e+00	9.438e-26
0.02	3.426e+07	0.000e+00	8.584e-27	0.000e+00	2.973e-28
0.03	6.517e+10	0.000e+00	3.096e-22	0.000e+00	3.068e-24
0.04	1.538e+10	7.716e-286	6.450e-22	3.412e-288	2.853e-24
0.05	8.827e+05	4.728e-162	3.361e-25	1.260e-164	8.952e-28
0.06	5.380e+07	7.966e-100	1.012e-22	1.582e-102	2.010e-25
0.08	4.603e+06	1.852e-49	4.805e-23	2.930e-52	7.604e-26
0.1	8.086e+06	1.389e-111	6.620e-23	2.124e-114	1.013e-25
0.15	2.454e+06	4.924e-43	8.809e-23	8.108e-46	1.451e-25
0.2	1.135e+07	2.353e-22	4.089e-18	4.153e-25	7.217e-21
0.3	1.915e+06	4.052e-11	2.701e-08	7.686e-14	5.123e-11
0.4	4.694e+07	4.190e-06	5.767e-04	8.164e-09	1.124e-06
0.6	9.956e+11	2.703e+01	8.681e+02	5.275e-02	1.695e+00
0.8	4.727e+07	1.180e-02	1.912e-01	2.244e-05	3.637e-04
1.0	5.514e+09	4.811e+00	5.155e+01	8.868e-03	9.502e-02
1.5	5.514e+09	2.481e+01	1.530e+02	4.175e-02	2.574e-01
Totals	1.100e+12	5.666e+01	1.073e+03	1.034e-01	2.047e+00

Results - Dose Point # 3 - (98.9756,100,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.209e-24	0.000e+00	1.037e-25
0.02	3.426e+07	0.000e+00	9.433e-27	0.000e+00	3.267e-28
0.03	6.517e+10	0.000e+00	3.402e-22	0.000e+00	3.371e-24
0.04	1.538e+10	0.000e+00	7.087e-22	0.000e+00	3.135e-24
0.05	8.827e+05	3.991e-195	3.693e-25	1.063e-197	9.838e-28
0.06	5.380e+07	2.340e-120	1.112e-22	4.647e-123	2.209e-25
0.08	4.603e+06	2.335e-59	5.280e-23	3.696e-62	8.356e-26
0.1	8.086e+06	1.528e-134	7.275e-23	2.338e-137	1.113e-25
0.15	2.454e+06	1.147e-51	9.680e-23	1.889e-54	1.594e-25
0.2	1.135e+07	7.342e-27	4.942e-22	1.296e-29	8.722e-25
0.3	1.915e+06	3.529e-13	3.764e-10	6.694e-16	7.140e-13
0.4	4.694e+07	2.043e-07	4.201e-05	3.980e-10	8.185e-08
0.6	9.956e+11	4.405e+00	1.976e+02	8.597e-03	3.856e-01
0.8	4.727e+07	3.037e-03	6.552e-02	5.777e-06	1.246e-04
1.0	5.514e+09	1.578e+00	2.182e+01	2.910e-03	4.022e-02
1.5	5.514e+09	1.077e+01	8.119e+01	1.812e-02	1.366e-01
Totals	1.100e+12	1.675e+01	3.006e+02	2.963e-02	5.625e-01

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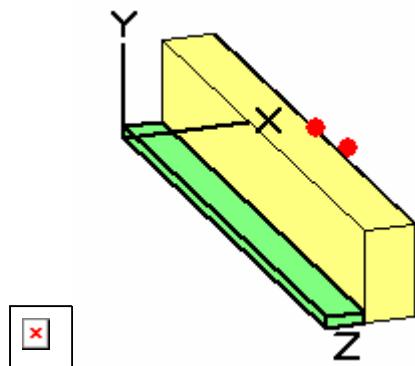
Case Title: PM2A Tanks
Description: V13 - 10 blankets lead shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	101.6 cm	(3 ft 4.0 in)
Width	1.5e+3 cm	(50 ft)
Height	30.48 cm	(1 ft)

Dose Points

A	X	Y	Z
# 1	2.52e+02 cm 8 ft 3.1 in	190.5 cm 6 ft 3.0 in	762 cm 25 ft
# 2	3.38e+02 cm 11 ft 1.1 in	190.5 cm 6 ft 3.0 in	762 cm 25 ft
# 3	2.52e+02 cm 8 ft 3.1 in	254 cm 8 ft 4.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	2.88e+05 in ³	V123 SLUDGE	1.02
Shield 1	55.0 in	Air	0.00122
Shield 2	.563 in	Iron	7.86
Shield 3	1.57 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Ag-108m	1.4116e-003	5.2229e+007	2.9910e-004	1.1067e+001
Am-241	3.9973e-003	1.4790e+008	8.4697e-004	3.1338e+001
Am-243	1.1323e-005	4.1894e+005	2.3992e-006	8.8769e-002

Ba-137m	2.9903e+001	1.1064e+012	6.3361e+000	2.3444e+005
C-14	2.6593e-004	9.8393e+006	5.6347e-005	2.0848e+000
Cm-243	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Cm-244	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Co-60	1.4902e-001	5.5137e+009	3.1575e-002	1.1683e+003
Cs-137	3.1610e+001	1.1696e+012	6.6978e+000	2.4782e+005
Fe-55	4.6495e-003	1.7203e+008	9.8518e-004	3.6452e+001
H-3	2.3248e-001	8.6017e+009	4.9259e-002	1.8226e+003
Ni-59	4.8001e-002	1.7760e+009	1.0171e-002	3.7632e+002
Ni-63	5.1011e+000	1.8874e+011	1.0809e+000	3.9992e+004
Np-237	3.8969e-005	1.4419e+006	8.2571e-006	3.0551e-001
Pu-238	2.2077e-002	8.1685e+008	4.6778e-003	1.7308e+002
Pu-239	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-240	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-241	2.0572e-002	7.6115e+008	4.3589e-003	1.6128e+002
Sr-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005
Tc-99	2.5422e-003	9.4061e+007	5.3866e-004	1.9930e+001
U-233	8.3959e-005	3.1065e+006	1.7790e-005	6.5823e-001
U-234	1.3112e-002	4.8516e+008	2.7784e-003	1.0280e+002
U-235	4.1812e-004	1.5471e+007	8.8596e-005	3.2780e+000
U-236	5.3353e-005	1.9740e+006	1.1305e-005	4.1828e-001
U-238	9.1151e-005	3.3726e+006	1.9314e-005	7.1461e-001
Y-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (99.1326,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.481e-24	0.000e+00	1.271e-25
0.02	3.426e+07	0.000e+00	1.156e-26	0.000e+00	4.003e-28
0.03	6.517e+10	0.000e+00	4.168e-22	0.000e+00	4.131e-24
0.04	1.538e+10	0.000e+00	8.684e-22	0.000e+00	3.840e-24
0.05	8.827e+05	1.243e-190	4.525e-25	3.311e-193	1.205e-27
0.06	5.380e+07	1.587e-117	1.363e-22	3.151e-120	2.707e-25
0.08	4.603e+06	6.366e-58	6.469e-23	1.007e-60	1.024e-25
0.1	8.086e+06	5.633e-132	8.913e-23	8.618e-135	1.364e-25
0.15	2.454e+06	1.388e-50	1.186e-22	2.286e-53	1.953e-25
0.2	1.135e+07	3.360e-26	1.282e-21	5.931e-29	2.262e-24
0.3	1.915e+06	8.792e-13	8.835e-10	1.668e-15	1.676e-12

0.4	4.694e+07	4.181e-07	8.114e-05	8.146e-10	1.581e-07
0.6	9.956e+11	7.691e+00	3.250e+02	1.501e-02	6.344e-01
0.8	4.727e+07	4.926e-03	1.004e-01	9.369e-06	1.910e-04
1.0	5.514e+09	2.449e+00	3.208e+01	4.514e-03	5.914e-02
1.5	5.514e+09	1.577e+01	1.137e+02	2.653e-02	1.913e-01
Totals	1.100e+12	2.591e+01	4.709e+02	4.606e-02	8.850e-01

Results - Dose Point # 2 - (133.1326,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.099e-24	0.000e+00	9.426e-26
0.02	3.426e+07	0.000e+00	8.572e-27	0.000e+00	2.969e-28
0.03	6.517e+10	0.000e+00	3.092e-22	0.000e+00	3.064e-24
0.04	1.538e+10	3.721e-315	6.441e-22	1.646e-317	2.849e-24
0.05	8.827e+05	3.190e-178	3.356e-25	8.499e-181	8.940e-28
0.06	5.380e+07	8.574e-110	1.011e-22	1.703e-112	2.008e-25
0.08	4.603e+06	3.700e-54	4.799e-23	5.855e-57	7.594e-26
0.1	8.086e+06	2.801e-123	6.611e-23	4.286e-126	1.011e-25
0.15	2.454e+06	2.835e-47	8.797e-23	4.669e-50	1.449e-25
0.2	1.135e+07	1.821e-24	4.304e-20	3.214e-27	7.596e-23
0.3	1.915e+06	5.463e-12	4.596e-09	1.036e-14	8.718e-12
0.4	4.694e+07	1.288e-06	2.122e-04	2.510e-09	4.134e-07
0.6	9.956e+11	1.400e+01	5.112e+02	2.733e-02	9.979e-01
0.8	4.727e+07	7.293e-03	1.309e-01	1.387e-05	2.489e-04
1.0	5.514e+09	3.245e+00	3.794e+01	5.982e-03	6.993e-02
1.5	5.514e+09	1.839e+01	1.212e+02	3.095e-02	2.040e-01
Totals	1.100e+12	3.565e+01	6.705e+02	6.427e-02	1.272e+00

Results - Dose Point # 3 - (99.1326,100,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	1.208e-24	0.000e+00	1.036e-25
0.02	3.426e+07	0.000e+00	9.423e-27	0.000e+00	3.264e-28
0.03	6.517e+10	0.000e+00	3.398e-22	0.000e+00	3.368e-24
0.04	1.538e+10	0.000e+00	7.080e-22	0.000e+00	3.131e-24
0.05	8.827e+05	1.400e-214	3.689e-25	3.730e-217	9.827e-28
0.06	5.380e+07	2.431e-132	1.111e-22	4.828e-135	2.207e-25
0.08	4.603e+06	5.215e-65	5.275e-23	8.253e-68	8.347e-26
0.1	8.086e+06	1.321e-148	7.267e-23	2.021e-151	1.112e-25
0.15	2.454e+06	9.112e-57	9.670e-23	1.500e-59	1.592e-25
0.2	1.135e+07	2.130e-29	2.887e-22	3.759e-32	5.095e-25
0.3	1.915e+06	3.154e-14	4.256e-11	5.983e-17	8.072e-14
0.4	4.694e+07	4.863e-08	1.200e-05	9.476e-11	2.338e-08
0.6	9.956e+11	1.952e+00	9.975e+01	3.809e-03	1.947e-01

0.8	4.727e+07	1.665e-03	3.991e-02	3.166e-06	7.591e-05
1.0	5.514e+09	9.627e-01	1.458e+01	1.775e-03	2.687e-02
1.5	5.514e+09	7.375e+00	5.972e+01	1.241e-02	1.005e-01
Totals	1.100e+12	1.029e+01	1.741e+02	1.799e-02	3.221e-01

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Run Time : 12:56:10 PM
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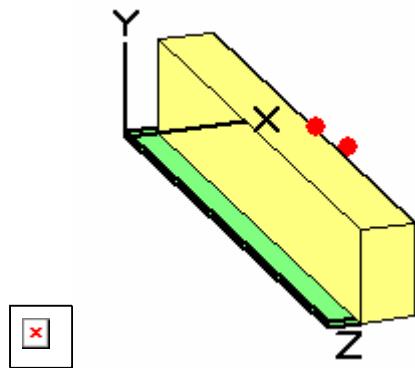
Case Title: PM2A Tanks
Description: V14 - 7 blankets lead shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	91.44 cm	(3 ft)
Width	1.5e+3 cm	(50 ft)
Height	15.24 cm	(6.0 in)

Dose Points

A	X	Y	Z
# 1	2.46e+02 cm 8 ft 0.7 in	190.5 cm 6 ft 3.0 in	762 cm 25 ft
# 2	3.32e+02 cm 10 ft 10.7 in	190.5 cm 6 ft 3.0 in	762 cm 25 ft
# 3	2.46e+02 cm 8 ft 0.7 in	254 cm 8 ft 4.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	1.30e+05 in ³	V123 SLUDGE	1.02
Shield 1	.57.0 in	Air	0.00122
Shield 2	.563 in	Iron	7.86
Shield 3	1.099 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices
Number of Groups : 25

Lower Energy Cutoff : 0.015
Photons < 0.015 : Included
Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Am-241	8.5164e-004	3.1511e+007	4.0101e-004	1.4837e+001
Ba-137m	8.7063e+000	3.2213e+011	4.0995e+000	1.5168e+005
C-14	9.6153e-005	3.5577e+006	4.5275e-005	1.6752e+000
Cm-243	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Cm-244	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Co-60	4.1987e-002	1.5535e+009	1.9770e-002	7.3149e+002
Cs-137	9.2033e+000	3.4052e+011	4.3335e+000	1.6034e+005
Fe-55	7.9670e-004	2.9478e+007	3.7514e-004	1.3880e+001
H-3	6.4102e-003	2.3718e+008	3.0183e-003	1.1168e+002
Ni-59	1.5568e-002	5.7600e+008	7.3302e-003	2.7122e+002
Ni-63	1.5201e+000	5.6245e+010	7.1578e-001	2.6484e+004
Pu-238	3.7317e-003	1.3807e+008	1.7571e-003	6.5013e+001
Pu-239	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-240	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-241	3.9606e-003	1.4654e+008	1.8649e-003	6.9001e+001
Sr-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005
Tc-99	1.0302e-003	3.8118e+007	4.8509e-004	1.7948e+001
U-233	2.0559e-005	7.6067e+005	9.6802e-006	3.5817e-001
U-234	6.8681e-003	2.5412e+008	3.2339e-003	1.1966e+002
U-235	2.2848e-004	8.4537e+006	1.0758e-004	3.9805e+000
U-236	4.3635e-005	1.6145e+006	2.0546e-005	7.6021e-001
U-238	8.1044e-005	2.9986e+006	3.8160e-005	1.4119e+000
Y-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (96.6616,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	4.223e-25	0.000e+00	3.623e-26
0.03	1.897e+10	0.000e+00	1.188e-22	0.000e+00	1.177e-24
0.04	4.478e+09	2.701e-252	2.475e-22	1.194e-254	1.095e-24
0.05	3.626e+05	1.474e-143	1.820e-25	3.927e-146	4.847e-28
0.06	1.144e+07	7.803e-89	2.838e-23	1.550e-91	5.637e-26
0.08	2.402e+05	3.427e-45	3.305e-24	5.424e-48	5.230e-27
0.1	1.658e+06	4.651e-98	1.789e-23	7.116e-101	2.737e-26
0.15	1.309e+06	4.081e-38	6.194e-23	6.720e-41	1.020e-25

0.2	5.448e+06	4.919e-20	5.595e-16	8.683e-23	9.875e-19
0.3	2.473e+05	7.835e-11	3.909e-08	1.486e-13	7.414e-11
0.6	2.899e+11	2.750e+01	7.582e+02	5.368e-02	1.480e+00
1.0	1.554e+09	3.598e+00	3.421e+01	6.633e-03	6.306e-02
1.5	1.554e+09	1.655e+01	9.189e+01	2.784e-02	1.546e-01
Totals	3.201e+11	4.765e+01	8.843e+02	8.815e-02	1.698e+00

Results - Dose Point # 2 - (130.6616,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.158e-25	0.000e+00	2.709e-26
0.03	1.897e+10	0.000e+00	8.882e-23	0.000e+00	8.803e-25
0.04	4.478e+09	3.033e-232	1.851e-22	1.341e-234	8.185e-25
0.05	3.626e+05	1.976e-132	1.361e-25	5.263e-135	3.625e-28
0.06	1.144e+07	7.029e-82	2.122e-23	1.396e-84	4.215e-26
0.08	2.402e+05	8.384e-42	2.471e-24	1.327e-44	3.911e-27
0.1	1.658e+06	2.267e-90	1.338e-23	3.469e-93	2.047e-26
0.15	1.309e+06	3.541e-35	4.631e-23	5.830e-38	7.627e-26
0.2	5.448e+06	1.774e-18	1.550e-14	3.131e-21	2.735e-17
0.3	2.473e+05	3.910e-10	1.570e-07	7.417e-13	2.978e-10
0.6	2.899e+11	4.388e+01	1.038e+03	8.565e-02	2.027e+00
1.0	1.554e+09	4.393e+00	3.739e+01	8.097e-03	6.893e-02
1.5	1.554e+09	1.823e+01	9.290e+01	3.067e-02	1.563e-01
Totals	3.201e+11	6.651e+01	1.169e+03	1.244e-01	2.252e+00

Results - Dose Point # 3 - (96.6616,100,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.441e-25	0.000e+00	2.952e-26
0.03	1.897e+10	0.000e+00	9.679e-23	0.000e+00	9.592e-25
0.04	4.478e+09	2.520e-286	2.017e-22	1.114e-288	8.918e-25
0.05	3.626e+05	2.404e-162	1.483e-25	6.404e-165	3.949e-28
0.06	1.144e+07	1.806e-100	2.312e-23	3.587e-103	4.592e-26
0.08	2.402e+05	8.752e-51	2.693e-24	1.385e-53	4.261e-27
0.1	1.658e+06	6.843e-111	1.458e-23	1.047e-113	2.230e-26
0.15	1.309e+06	6.269e-43	5.046e-23	1.032e-45	8.310e-26
0.2	5.448e+06	1.484e-22	2.506e-18	2.619e-25	4.423e-21
0.3	2.473e+05	5.288e-12	3.539e-09	1.003e-14	6.713e-12
0.6	2.899e+11	8.752e+00	2.923e+02	1.708e-02	5.705e-01
1.0	1.554e+09	1.628e+00	1.786e+01	3.001e-03	3.292e-02
1.5	1.554e+09	8.606e+00	5.351e+01	1.448e-02	9.003e-02
Totals	3.201e+11	1.899e+01	3.636e+02	3.456e-02	6.934e-01

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Run Time : 12:53:16 PM
Duration : 00:00:07

File Ref :
Date :
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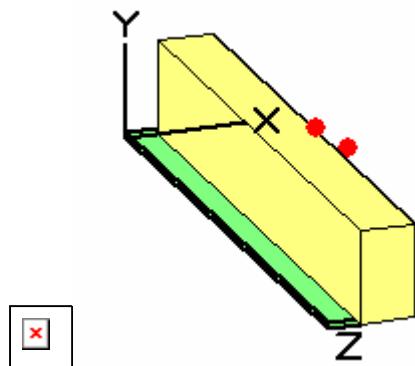
Case Title: PM2A Tanks
Description: V14 - 8 blankets lead shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	91.44 cm	(3 ft)
Width	1.5e+3 cm	(50 ft)
Height	15.24 cm	(6.0 in)

Dose Points

A	X	Y	Z
# 1	2.46e+02 cm 8 ft 0.8 in	190.5 cm 6 ft 3.0 in	762 cm 25 ft
# 2	3.32e+02 cm 10 ft 10.8 in	190.5 cm 6 ft 3.0 in	762 cm 25 ft
# 3	2.46e+02 cm 8 ft 0.8 in	254 cm 8 ft 4.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	1.30e+05 in ³	V123 SLUDGE	1.02
Shield 1	57.0 in	Air	0.00122
Shield 2	.563 in	Iron	7.86
Shield 3	1.256 in	Lead	11.34
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Am-241	8.5164e-004	3.1511e+007	4.0101e-004	1.4837e+001
Ba-137m	8.7063e+000	3.2213e+011	4.0995e+000	1.5168e+005
C-14	9.6153e-005	3.5577e+006	4.5275e-005	1.6752e+000

Cm-243	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Cm-244	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Co-60	4.1987e-002	1.5535e+009	1.9770e-002	7.3149e+002
Cs-137	9.2033e+000	3.4052e+011	4.3335e+000	1.6034e+005
Fe-55	7.9670e-004	2.9478e+007	3.7514e-004	1.3880e+001
H-3	6.4102e-003	2.3718e+008	3.0183e-003	1.1168e+002
Ni-59	1.5568e-002	5.7600e+008	7.3302e-003	2.7122e+002
Ni-63	1.5201e+000	5.6245e+010	7.1578e-001	2.6484e+004
Pu-238	3.7317e-003	1.3807e+008	1.7571e-003	6.5013e+001
Pu-239	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-240	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-241	3.9606e-003	1.4654e+008	1.8649e-003	6.9001e+001
Sr-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005
Tc-99	1.0302e-003	3.8118e+007	4.8509e-004	1.7948e+001
U-233	2.0559e-005	7.6067e+005	9.6802e-006	3.5817e-001
U-234	6.8681e-003	2.5412e+008	3.2339e-003	1.1966e+002
U-235	2.2848e-004	8.4537e+006	1.0758e-004	3.9805e+000
U-236	4.3635e-005	1.6145e+006	2.0546e-005	7.6021e-001
U-238	8.1044e-005	2.9986e+006	3.8160e-005	1.4119e+000
Y-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005

Buildup : The material reference is - Shield 1
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (96.8186,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	4.218e-25	0.000e+00	3.618e-26
0.03	1.897e+10	0.000e+00	1.186e-22	0.000e+00	1.176e-24
0.04	4.478e+09	8.529e-285	2.472e-22	3.772e-287	1.093e-24
0.05	3.626e+05	1.750e-161	1.817e-25	4.662e-164	4.841e-28
0.06	1.144e+07	6.883e-100	2.834e-23	1.367e-102	5.629e-26
0.08	2.402e+05	2.049e-50	3.301e-24	3.243e-53	5.223e-27
0.1	1.658e+06	4.956e-111	1.787e-23	7.583e-114	2.733e-26
0.15	1.309e+06	7.823e-43	6.185e-23	1.288e-45	1.019e-25
0.2	5.448e+06	2.175e-22	3.670e-18	3.839e-25	6.477e-21
0.3	2.473e+05	8.237e-12	5.435e-09	1.563e-14	1.031e-11
0.6	2.899e+11	1.295e+01	4.165e+02	2.529e-02	8.129e-01
1.0	1.554e+09	2.286e+00	2.415e+01	4.213e-03	4.452e-02
1.5	1.554e+09	1.170e+01	7.049e+01	1.969e-02	1.186e-01
Totals	3.201e+11	2.694e+01	5.111e+02	4.919e-02	9.760e-01

Results - Dose Point # 2 - (130.8186,75,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.154e-25	0.000e+00	2.705e-26
0.03	1.897e+10	0.000e+00	8.871e-23	0.000e+00	8.792e-25
0.04	4.478e+09	3.199e-262	1.848e-22	1.415e-264	8.174e-25
0.05	3.626e+05	5.615e-149	1.359e-25	1.496e-151	3.620e-28
0.06	1.144e+07	4.378e-92	2.119e-23	8.695e-95	4.209e-26
0.08	2.402e+05	1.277e-46	2.468e-24	2.021e-49	3.906e-27
0.1	1.658e+06	2.401e-102	1.336e-23	3.673e-105	2.044e-26
0.15	1.309e+06	1.585e-39	4.625e-23	2.610e-42	7.617e-26
0.2	5.448e+06	1.198e-20	1.561e-16	2.114e-23	2.755e-19
0.3	2.473e+05	4.999e-11	2.654e-08	9.482e-14	5.034e-11
0.6	2.899e+11	2.236e+01	6.146e+02	4.365e-02	1.200e+00
1.0	1.554e+09	2.933e+00	2.762e+01	5.406e-03	5.092e-02
1.5	1.554e+09	1.340e+01	7.382e+01	2.255e-02	1.242e-01
Totals	3.201e+11	3.870e+01	7.160e+02	7.161e-02	1.375e+00

Results - Dose Point # 3 - (96.8186,100,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	3.438e-25	0.000e+00	2.949e-26
0.03	1.897e+10	0.000e+00	9.669e-23	0.000e+00	9.582e-25
0.04	4.478e+09	0.000e+00	2.014e-22	0.000e+00	8.909e-25
0.05	3.626e+05	1.186e-182	1.481e-25	3.160e-185	3.945e-28
0.06	1.144e+07	5.467e-113	2.310e-23	1.086e-115	4.588e-26
0.08	2.402e+05	1.079e-56	2.690e-24	1.707e-59	4.257e-27
0.1	1.658e+06	1.390e-125	1.456e-23	2.126e-128	2.228e-26
0.15	1.309e+06	2.893e-48	5.041e-23	4.764e-51	8.302e-26
0.2	5.448e+06	3.243e-25	8.108e-21	5.724e-28	1.431e-23
0.3	2.473e+05	4.166e-13	3.714e-10	7.902e-16	7.045e-13
0.6	2.899e+11	3.721e+00	1.456e+02	7.263e-03	2.841e-01
1.0	1.554e+09	9.704e-01	1.188e+01	1.789e-03	2.190e-02
1.5	1.554e+09	5.795e+00	3.924e+01	9.750e-03	6.602e-02
Totals	3.201e+11	1.049e+01	1.967e+02	1.880e-02	3.720e-01

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Run Time : 1:10:58 PM
Duration : 00:00:15

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Date :
By :
Checked :

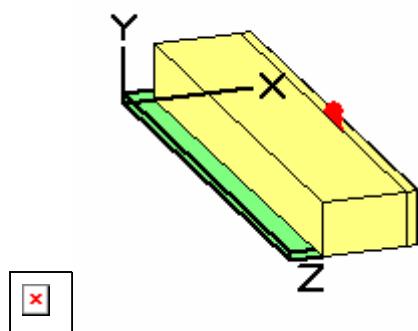
Case Title: PM2A Tanks
Description: V13 - 14 inches concrete shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	101.6 cm	(3 ft 4.0 in)
Width	1.5e+3 cm	(50 ft)
Height	30.48 cm	(1 ft)

Dose Points

A	X	Y	Z
# 1	4.23e+02 cm 13 ft 10.6 in	30.48 cm 1 ft	762 cm 25 ft
# 2	4.23e+02 cm 13 ft 10.6 in	60.96 cm 2 ft	762 cm 25 ft
# 3	4.23e+02 cm 13 ft 10.6 in	91.44 cm 3 ft	762 cm 25 ft
# 4	4.23e+02 cm 13 ft 10.6 in	121.92 cm 4 ft	762 cm 25 ft
# 5	4.23e+02 cm 13 ft 10.6 in	152.4 cm 5 ft 0.0 in	762 cm 25 ft
# 6	4.23e+02 cm 13 ft 10.6 in	182.88 cm 6 ft	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	2.88e+05 in ³	V123 SLUDGE	1.02
Shield 1	.562 in	Iron	7.86
Shield 2	110.0 in	Air	0.00122
Shield 3	14.0 in	Concrete	2.35
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Ag-108m	1.4116e-003	5.2229e+007	2.9910e-004	1.1067e+001
Am-241	3.9973e-003	1.4790e+008	8.4697e-004	3.1338e+001

Am-243	1.1323e-005	4.1894e+005	2.3992e-006	8.8769e-002
Ba-137m	2.9903e+001	1.1064e+012	6.3361e+000	2.3444e+005
C-14	2.6593e-004	9.8393e+006	5.6347e-005	2.0848e+000
Cm-243	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Cm-244	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Co-60	1.4902e-001	5.5137e+009	3.1575e-002	1.1683e+003
Cs-137	3.1610e+001	1.1696e+012	6.6978e+000	2.4782e+005
Fe-55	4.6495e-003	1.7203e+008	9.8518e-004	3.6452e+001
H-3	2.3248e-001	8.6017e+009	4.9259e-002	1.8226e+003
Ni-59	4.8001e-002	1.7760e+009	1.0171e-002	3.7632e+002
Ni-63	5.1011e+000	1.8874e+011	1.0809e+000	3.9992e+004
Np-237	3.8969e-005	1.4419e+006	8.2571e-006	3.0551e-001
Pu-238	2.2077e-002	8.1685e+008	4.6778e-003	1.7308e+002
Pu-239	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-240	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-241	2.0572e-002	7.6115e+008	4.3589e-003	1.6128e+002
Sr-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005
Tc-99	2.5422e-003	9.4061e+007	5.3866e-004	1.9930e+001
U-233	8.3959e-005	3.1065e+006	1.7790e-005	6.5823e-001
U-234	1.3112e-002	4.8516e+008	2.7784e-003	1.0280e+002
U-235	4.1812e-004	1.5471e+007	8.8596e-005	3.2780e+000
U-236	5.3353e-005	1.9740e+006	1.1305e-005	4.1828e-001
U-238	9.1151e-005	3.3726e+006	1.9314e-005	7.1461e-001
Y-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005

**Buildup : The material reference is - Shield 2
Integration Parameters**

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (166.5625,12,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	9.616e-25	0.000e+00	8.248e-26
0.02	3.426e+07	3.230e-257	7.501e-27	1.119e-258	2.598e-28
0.03	6.517e+10	1.573e-81	2.705e-22	1.559e-83	2.681e-24
0.04	1.538e+10	7.873e-39	5.636e-22	3.482e-41	2.493e-24
0.05	8.827e+05	2.511e-27	5.119e-24	6.690e-30	1.364e-26
0.06	5.380e+07	1.944e-18	5.550e-15	3.861e-21	1.102e-17
0.08	4.603e+06	1.362e-13	3.265e-10	2.155e-16	5.166e-13
0.1	8.086e+06	5.139e-11	8.845e-08	7.862e-14	1.353e-10
0.15	2.454e+06	2.569e-09	2.000e-06	4.231e-12	3.293e-09
0.2	1.135e+07	1.083e-07	4.515e-05	1.911e-10	7.968e-08

0.3	1.915e+06	2.174e-07	3.655e-05	4.124e-10	6.933e-08
0.4	4.694e+07	2.573e-05	2.323e-03	5.013e-08	4.527e-06
0.6	9.956e+11	4.379e+00	1.765e+02	8.548e-03	3.446e-01
0.8	4.727e+07	8.441e-04	2.040e-02	1.605e-06	3.880e-05
1.0	5.514e+09	2.805e-01	4.727e+00	5.170e-04	8.714e-03
1.5	5.514e+09	1.683e+00	1.596e+01	2.832e-03	2.685e-02
Totals	1.100e+12	6.344e+00	1.972e+02	1.190e-02	3.802e-01

Results - Dose Point # 2 - (166.5625,24,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	9.527e-25	0.000e+00	8.172e-26
0.02	3.426e+07	2.837e-258	7.432e-27	9.827e-260	2.574e-28
0.03	6.517e+10	6.196e-82	2.680e-22	6.141e-84	2.656e-24
0.04	1.538e+10	5.273e-39	5.584e-22	2.332e-41	2.470e-24
0.05	8.827e+05	2.102e-27	4.372e-24	5.599e-30	1.165e-26
0.06	5.380e+07	1.807e-18	5.252e-15	3.589e-21	1.043e-17
0.08	4.603e+06	1.380e-13	3.367e-10	2.183e-16	5.328e-13
0.1	8.086e+06	5.375e-11	9.409e-08	8.223e-14	1.440e-10
0.15	2.454e+06	2.762e-09	2.180e-06	4.548e-12	3.590e-09
0.2	1.135e+07	1.176e-07	4.959e-05	2.075e-10	8.753e-08
0.3	1.915e+06	2.383e-07	4.039e-05	4.520e-10	7.662e-08
0.4	4.694e+07	2.834e-05	2.574e-03	5.521e-08	5.015e-06
0.6	9.956e+11	4.845e+00	1.958e+02	9.456e-03	3.822e-01
0.8	4.727e+07	9.352e-04	2.261e-02	1.779e-06	4.301e-05
1.0	5.514e+09	3.108e-01	5.231e+00	5.729e-04	9.642e-03
1.5	5.514e+09	1.860e+00	1.757e+01	3.130e-03	2.955e-02
Totals	1.100e+12	7.017e+00	2.186e+02	1.316e-02	4.214e-01

Results - Dose Point # 3 - (166.5625,36,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	9.356e-25	0.000e+00	8.025e-26
0.02	3.426e+07	1.088e-259	7.298e-27	3.768e-261	2.528e-28
0.03	6.517e+10	1.199e-82	2.632e-22	1.189e-84	2.608e-24
0.04	1.538e+10	2.112e-39	5.484e-22	9.339e-42	2.425e-24
0.05	8.827e+05	1.235e-27	2.724e-24	3.290e-30	7.256e-27
0.06	5.380e+07	1.284e-18	3.854e-15	2.550e-21	7.654e-18
0.08	4.603e+06	1.151e-13	2.909e-10	1.822e-16	4.603e-13
0.1	8.086e+06	4.774e-11	8.650e-08	7.304e-14	1.323e-10
0.15	2.454e+06	2.594e-09	2.113e-06	4.272e-12	3.480e-09
0.2	1.135e+07	1.129e-07	4.897e-05	1.992e-10	8.643e-08
0.3	1.915e+06	2.340e-07	4.060e-05	4.439e-10	7.702e-08
0.4	4.694e+07	2.820e-05	2.612e-03	5.494e-08	5.089e-06

0.6	9.956e+11	4.898e+00	2.009e+02	9.560e-03	3.921e-01
0.8	4.727e+07	9.543e-04	2.334e-02	1.815e-06	4.439e-05
1.0	5.514e+09	3.191e-01	5.418e+00	5.881e-04	9.987e-03
1.5	5.514e+09	1.925e+00	1.827e+01	3.239e-03	3.073e-02
Totals	1.100e+12	7.143e+00	2.246e+02	1.339e-02	4.329e-01

Results - Dose Point # 4 - (166.5625,48,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	9.111e-25	0.000e+00	7.815e-26
0.02	3.426e+07	7.429e-263	7.107e-27	2.573e-264	2.462e-28
0.03	6.517e+10	8.485e-84	2.563e-22	8.409e-86	2.540e-24
0.04	1.538e+10	5.341e-40	5.340e-22	2.362e-42	2.362e-24
0.05	8.827e+05	5.326e-28	1.348e-24	1.419e-30	3.591e-27
0.06	5.380e+07	7.198e-19	2.260e-15	1.430e-21	4.489e-18
0.08	4.603e+06	8.099e-14	2.149e-10	1.282e-16	3.400e-13
0.1	8.086e+06	3.672e-11	6.989e-08	5.617e-14	1.069e-10
0.15	2.454e+06	2.164e-09	1.846e-06	3.563e-12	3.040e-09
0.2	1.135e+07	9.728e-08	4.402e-05	1.717e-10	7.769e-08
0.3	1.915e+06	2.087e-07	3.754e-05	3.959e-10	7.121e-08
0.4	4.694e+07	2.567e-05	2.453e-03	5.002e-08	4.779e-06
0.6	9.956e+11	4.575e+00	1.924e+02	8.931e-03	3.755e-01
0.8	4.727e+07	9.060e-04	2.261e-02	1.723e-06	4.301e-05
1.0	5.514e+09	3.063e-01	5.294e+00	5.647e-04	9.758e-03
1.5	5.514e+09	1.880e+00	1.806e+01	3.163e-03	3.039e-02
Totals	1.100e+12	6.763e+00	2.158e+02	1.266e-02	4.157e-01

Results - Dose Point # 5 - (166.5625,60,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	8.807e-25	0.000e+00	7.554e-26
0.02	3.426e+07	2.534e-267	6.871e-27	8.777e-269	2.380e-28
0.03	6.517e+10	2.492e-85	2.478e-22	2.470e-87	2.456e-24
0.04	1.538e+10	9.001e-41	5.162e-22	3.981e-43	2.283e-24
0.05	8.827e+05	1.754e-28	6.208e-25	4.672e-31	1.654e-27
0.06	5.380e+07	3.278e-19	1.087e-15	6.510e-22	2.159e-18
0.08	4.603e+06	4.891e-14	1.379e-10	7.740e-17	2.182e-13
0.1	8.086e+06	2.482e-11	5.026e-08	3.797e-14	7.689e-11
0.15	2.454e+06	1.622e-09	1.469e-06	2.672e-12	2.419e-09
0.2	1.135e+07	7.608e-08	3.635e-05	1.343e-10	6.416e-08
0.3	1.915e+06	1.707e-07	3.219e-05	3.238e-10	6.106e-08
0.4	4.694e+07	2.158e-05	2.149e-03	4.204e-08	4.187e-06
0.6	9.956e+11	3.982e+00	1.732e+02	7.772e-03	3.381e-01
0.8	4.727e+07	8.062e-04	2.071e-02	1.533e-06	3.939e-05

1.0	5.514e+09	2.769e-01	4.908e+00	5.105e-04	9.046e-03
1.5	5.514e+09	1.743e+00	1.706e+01	2.933e-03	2.871e-02
Totals	1.100e+12	6.002e+00	1.952e+02	1.122e-02	3.758e-01

Results - Dose Point # 6 - (166.5625,72,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	0.000e+00	8.459e-25	0.000e+00	7.255e-26
0.02	3.426e+07	5.758e-273	6.599e-27	1.995e-274	2.286e-28
0.03	6.517e+10	3.229e-87	2.380e-22	3.200e-89	2.358e-24
0.04	1.538e+10	1.041e-41	4.958e-22	4.606e-44	2.193e-24
0.05	8.827e+05	4.561e-29	3.454e-25	1.215e-31	9.200e-28
0.06	5.380e+07	1.248e-19	4.408e-16	2.478e-22	8.755e-19
0.08	4.603e+06	2.591e-14	7.837e-11	4.101e-17	1.240e-13
0.1	8.086e+06	1.501e-11	3.268e-08	2.297e-14	5.000e-11
0.15	2.454e+06	1.110e-09	1.077e-06	1.828e-12	1.774e-09
0.2	1.135e+07	5.473e-08	2.788e-05	9.660e-11	4.921e-08
0.3	1.915e+06	1.296e-07	2.585e-05	2.458e-10	4.903e-08
0.4	4.694e+07	1.693e-05	1.771e-03	3.299e-08	3.451e-06
0.6	9.956e+11	3.259e+00	1.477e+02	6.361e-03	2.882e-01
0.8	4.727e+07	6.782e-04	1.804e-02	1.290e-06	3.431e-05
1.0	5.514e+09	2.376e-01	4.343e+00	4.380e-04	8.005e-03
1.5	5.514e+09	1.543e+00	1.547e+01	2.597e-03	2.603e-02
Totals	1.100e+12	5.041e+00	1.675e+02	9.397e-03	3.223e-01

Page :1
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Run Date : June 9, 2004
Run Time : 12:57:32 PM
Duration : 00:00:13

File Ref :

Date :

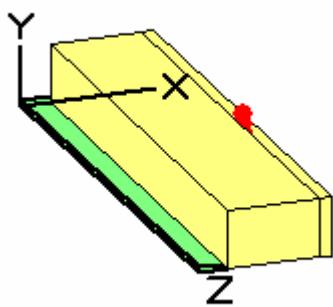
By :

Checked :

Case Title: PM2A Tanks
Description: V14 - 14 inches concrete shielding
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	91.44 cm	(3 ft)
Width	1.5e+3 cm	(50 ft)
Height	15.24 cm	(6.0 in)



Dose Points

A	X	Y	Z
# 1	4.18e+02 cm 13 ft 8.6 in	30.48 cm 1 ft	762 cm 25 ft
# 2	4.18e+02 cm 13 ft 8.6 in	60.96 cm 2 ft	762 cm 25 ft

# 3	4.18e+02 cm 13 ft 8.6 in	91.44 cm 3 ft	762 cm 25 ft
# 4	4.18e+02 cm 13 ft 8.6 in	121.92 cm 4 ft	762 cm 25 ft
# 5	4.18e+02 cm 13 ft 8.6 in	152.4 cm 5 ft 0.0 in	762 cm 25 ft
# 6	4.18e+02 cm 13 ft 8.6 in	182.88 cm 6 ft	762 cm 25 ft

Shields

Shield N	Dimension	Material	Density
Source	1.30e+05 in ³	V123 SLUDGE	1.02
Shield 1	.562 in	Lead	11.34
Shield 2	112.0 in	Air	0.00122
Shield 3	14.0 in	Concrete	2.35
Shield 4	1.0 in	Air	0.00122
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Am-241	8.5164e-004	3.1511e+007	4.0101e-004	1.4837e+001
Ba-137m	8.7063e+000	3.2213e+011	4.0995e+000	1.5168e+005
C-14	9.6153e-005	3.5577e+006	4.5275e-005	1.6752e+000
Cm-243	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Cm-244	4.5146e-005	1.6704e+006	2.1258e-005	7.8653e-001
Co-60	4.1987e-002	1.5535e+009	1.9770e-002	7.3149e+002
Cs-137	9.2033e+000	3.4052e+011	4.3335e+000	1.6034e+005
Fe-55	7.9670e-004	2.9478e+007	3.7514e-004	1.3880e+001
H-3	6.4102e-003	2.3718e+008	3.0183e-003	1.1168e+002
Ni-59	1.5568e-002	5.7600e+008	7.3302e-003	2.7122e+002
Ni-63	1.5201e+000	5.6245e+010	7.1578e-001	2.6484e+004
Pu-238	3.7317e-003	1.3807e+008	1.7571e-003	6.5013e+001
Pu-239	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-240	3.2326e-003	1.1961e+008	1.5221e-003	5.6318e+001
Pu-241	3.9606e-003	1.4654e+008	1.8649e-003	6.9001e+001
Sr-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005
Tc-99	1.0302e-003	3.8118e+007	4.8509e-004	1.7948e+001
U-233	2.0559e-005	7.6067e+005	9.6802e-006	3.5817e-001
U-234	6.8681e-003	2.5412e+008	3.2339e-003	1.1966e+002
U-235	2.2848e-004	8.4537e+006	1.0758e-004	3.9805e+000

U-236	4.3635e-005	1.6145e+006	2.0546e-005	7.6021e-001
U-238	8.1044e-005	2.9986e+006	3.8160e-005	1.4119e+000
Y-90	7.6923e+000	2.8461e+011	3.6220e+000	1.3401e+005

Buildup : The material reference is - Shield 2
Integration Parameters

X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (164.5625,12,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	2.792e-25	0.000e+00	2.395e-26
0.03	1.897e+10	7.585e-248	7.854e-23	7.518e-250	7.783e-25
0.04	4.478e+09	1.218e-117	1.636e-22	5.385e-120	7.237e-25
0.05	3.626e+05	3.756e-71	1.203e-25	1.000e-73	3.205e-28
0.06	1.144e+07	7.320e-46	1.876e-23	1.454e-48	3.727e-26
0.08	2.402e+05	2.717e-27	7.841e-23	4.300e-30	1.241e-25
0.1	1.658e+06	4.897e-48	1.183e-23	7.492e-51	1.810e-26
0.15	1.309e+06	2.326e-22	5.836e-18	3.831e-25	9.610e-21
0.2	5.448e+06	5.013e-14	1.548e-10	8.848e-17	2.732e-13
0.3	2.473e+05	2.192e-10	8.534e-08	4.158e-13	1.619e-10
0.6	2.899e+11	5.325e-01	2.589e+01	1.039e-03	5.053e-02
1.0	1.554e+09	6.199e-02	1.122e+00	1.143e-04	2.069e-03
1.5	1.554e+09	4.344e-01	4.285e+00	7.308e-04	7.209e-03
Totals	3.201e+11	1.029e+00	3.130e+01	1.884e-03	5.981e-02

Results - Dose Point # 2 - (164.5625,24,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	2.760e-25	0.000e+00	2.368e-26
0.03	1.897e+10	2.245e-249	7.764e-23	2.225e-251	7.695e-25
0.04	4.478e+09	2.033e-118	1.618e-22	8.990e-121	7.154e-25
0.05	3.626e+05	1.443e-71	1.189e-25	3.843e-74	3.168e-28
0.06	1.144e+07	4.253e-46	1.855e-23	8.448e-49	3.684e-26
0.08	2.402e+05	2.277e-27	6.754e-23	3.604e-30	1.069e-25
0.1	1.658e+06	2.731e-48	1.169e-23	4.178e-51	1.789e-26
0.15	1.309e+06	2.076e-22	5.355e-18	3.418e-25	8.818e-21
0.2	5.448e+06	5.156e-14	1.626e-10	9.100e-17	2.869e-13
0.3	2.473e+05	2.457e-10	9.693e-08	4.662e-13	1.839e-10
0.6	2.899e+11	6.231e-01	3.039e+01	1.216e-03	5.931e-02
1.0	1.554e+09	7.292e-02	1.316e+00	1.344e-04	2.426e-03
1.5	1.554e+09	5.089e-01	4.987e+00	8.563e-04	8.390e-03

Totals	3.201e+11	1.205e+00	3.669e+01	2.207e-03	7.013e-02
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Results - Dose Point # 3 - (164.5625,36,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	2.705e-25	0.000e+00	2.320e-26
0.03	1.897e+10	3.578e-252	7.608e-23	3.546e-254	7.540e-25
0.04	4.478e+09	8.202e-120	1.585e-22	3.628e-122	7.011e-25
0.05	3.626e+05	2.226e-72	1.165e-25	5.931e-75	3.105e-28
0.06	1.144e+07	1.291e-46	1.818e-23	2.563e-49	3.610e-26
0.08	2.402e+05	1.281e-27	4.025e-23	2.027e-30	6.369e-26
0.1	1.658e+06	7.797e-49	1.146e-23	1.193e-51	1.753e-26
0.15	1.309e+06	1.312e-22	3.559e-18	2.161e-25	5.861e-21
0.2	5.448e+06	4.175e-14	1.371e-10	7.369e-17	2.420e-13
0.3	2.473e+05	2.326e-10	9.454e-08	4.412e-13	1.793e-10
0.6	2.899e+11	6.453e-01	3.201e+01	1.260e-03	6.248e-02
1.0	1.554e+09	7.746e-02	1.412e+00	1.428e-04	2.602e-03
1.5	1.554e+09	5.460e-01	5.374e+00	9.187e-04	9.042e-03
Totals	3.201e+11	1.269e+00	3.879e+01	2.321e-03	7.412e-02

Results - Dose Point # 4 - (164.5625,48,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	2.630e-25	0.000e+00	2.255e-26
0.03	1.897e+10	3.665e-256	7.396e-23	3.633e-258	7.330e-25
0.04	4.478e+09	9.193e-122	1.541e-22	4.066e-124	6.815e-25
0.05	3.626e+05	1.576e-73	1.133e-25	4.199e-76	3.018e-28
0.06	1.144e+07	2.255e-47	1.767e-23	4.478e-50	3.509e-26
0.08	2.402e+05	5.116e-28	1.789e-23	8.096e-31	2.832e-26
0.1	1.658e+06	1.254e-49	1.114e-23	1.919e-52	1.704e-26
0.15	1.309e+06	6.157e-23	1.788e-18	1.014e-25	2.944e-21
0.2	5.448e+06	2.754e-14	9.574e-11	4.861e-17	1.690e-13
0.3	2.473e+05	1.909e-10	8.107e-08	3.622e-13	1.538e-10
0.6	2.899e+11	6.034e-01	3.075e+01	1.178e-03	6.002e-02
1.0	1.554e+09	7.543e-02	1.399e+00	1.390e-04	2.580e-03
1.5	1.554e+09	5.420e-01	5.396e+00	9.119e-04	9.079e-03
Totals	3.201e+11	1.221e+00	3.755e+01	2.229e-03	7.168e-02

Results - Dose Point # 5 - (164.5625,60,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	2.538e-25	0.000e+00	2.177e-26
0.03	1.897e+10	2.611e-261	7.138e-23	2.588e-263	7.074e-25

0.04	4.478e+09	2.999e-124	1.487e-22	1.326e-126	6.577e-25
0.05	3.626e+05	5.503e-75	1.093e-25	1.466e-77	2.913e-28
0.06	1.144e+07	2.435e-48	1.705e-23	4.837e-51	3.387e-26
0.08	2.402e+05	1.521e-28	6.759e-24	2.408e-31	1.070e-26
0.1	1.658e+06	1.222e-50	1.075e-23	1.869e-53	1.645e-26
0.15	1.309e+06	2.231e-23	7.034e-19	3.674e-26	1.158e-21
0.2	5.448e+06	1.521e-14	5.670e-11	2.685e-17	1.001e-13
0.3	2.473e+05	1.386e-10	6.214e-08	2.629e-13	1.179e-10
0.6	2.899e+11	5.167e-01	2.726e+01	1.009e-03	5.320e-02
1.0	1.554e+09	6.808e-02	1.294e+00	1.255e-04	2.385e-03
1.5	1.554e+09	5.024e-01	5.087e+00	8.453e-04	8.560e-03
Totals	3.201e+11	1.087e+00	3.364e+01	1.979e-03	6.415e-02

Results - Dose Point # 6 - (164.5625,72,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.629e+09	0.000e+00	2.434e-25	0.000e+00	2.088e-26
0.03	1.897e+10	1.469e-267	6.846e-23	1.456e-269	6.785e-25
0.04	4.478e+09	3.009e-127	1.426e-22	1.331e-129	6.309e-25
0.05	3.626e+05	9.905e-77	1.049e-25	2.639e-79	2.794e-28
0.06	1.144e+07	1.707e-49	1.636e-23	3.390e-52	3.249e-26
0.08	2.402e+05	3.502e-29	2.912e-24	5.542e-32	4.608e-27
0.1	1.658e+06	7.575e-52	1.031e-23	1.159e-54	1.577e-26
0.15	1.309e+06	6.455e-24	2.233e-19	1.063e-26	3.678e-22
0.2	5.448e+06	7.190e-15	2.903e-11	1.269e-17	5.124e-14
0.3	2.473e+05	9.030e-11	4.314e-08	1.713e-13	8.183e-11
0.6	2.899e+11	4.096e-01	2.252e+01	7.995e-04	4.395e-02
1.0	1.554e+09	5.755e-02	1.127e+00	1.061e-04	2.077e-03
1.5	1.554e+09	4.394e-01	4.549e+00	7.392e-04	7.653e-03
Totals	3.201e+11	9.065e-01	2.819e+01	1.645e-03	5.368e-02

Page	:1	File Ref	:
DOS File	:v13 mezzanine exposure.ms6	Date	:
Run Date	: June 9, 2004	By	:
Run Time	: 10:58:59 AM	Checked	:
Duration	: 00:00:14		

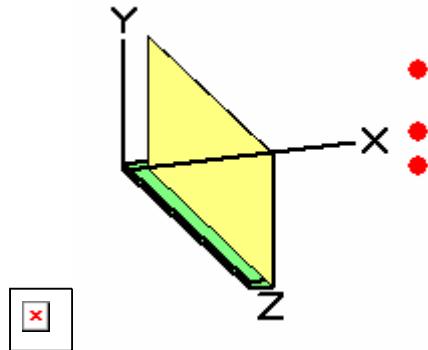
Case Title: PM2A Tanks
Description: V13 mezzanine exposure at 25 ft high 30 ft away
Geometry: 13 - Rectangular Volume

Source Dimensions:

Length	101.6 cm	(3 ft 4.0 in)
Width	1.5e+3 cm	(50 ft)
Height	30.48 cm	(1 ft)

Dose Points

A	X	Y	Z
# 1	1.02e+03 cm 33 ft 4.6 in	579.12 cm 19 ft	762 cm 25 ft
# 2	1.02e+03 cm 33 ft 4.6 in	304.8 cm 10 ft 0.0 in	762 cm 25 ft
# 3	1.02e+03 cm 33 ft 4.6 in	152.4 cm 5 ft 0.0 in	762 cm 25 ft



Shields

Shield N	Dimension	Material	Density
Source	2.88e+05 in ³	V123 SLUDGE	1.02
Shield 1	.562 in	Iron	7.86
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input : Grouping Method - Standard Indices

Number of Groups : 25

Lower Energy Cutoff : 0.015

Photons < 0.015 : Included

Library : Grove

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Ag-108m	1.4116e-003	5.2229e+007	2.9910e-004	1.1067e+001
Am-241	3.9973e-003	1.4790e+008	8.4697e-004	3.1338e+001
Am-243	1.1323e-005	4.1894e+005	2.3992e-006	8.8769e-002
Ba-137m	2.9903e+001	1.1064e+012	6.3361e+000	2.3444e+005
C-14	2.6593e-004	9.8393e+006	5.6347e-005	2.0848e+000
Cm-243	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Cm-244	3.4955e-004	1.2933e+007	7.4066e-005	2.7404e+000
Co-60	1.4902e-001	5.5137e+009	3.1575e-002	1.1683e+003
Cs-137	3.1610e+001	1.1696e+012	6.6978e+000	2.4782e+005
Fe-55	4.6495e-003	1.7203e+008	9.8518e-004	3.6452e+001
H-3	2.3248e-001	8.6017e+009	4.9259e-002	1.8226e+003
Ni-59	4.8001e-002	1.7760e+009	1.0171e-002	3.7632e+002
Ni-63	5.1011e+000	1.8874e+011	1.0809e+000	3.9992e+004
Np-237	3.8969e-005	1.4419e+006	8.2571e-006	3.0551e-001
Pu-238	2.2077e-002	8.1685e+008	4.6778e-003	1.7308e+002

Pu-239	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-240	1.5839e-002	5.8603e+008	3.3560e-003	1.2417e+002
Pu-241	2.0572e-002	7.6115e+008	4.3589e-003	1.6128e+002
Sr-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005
Tc-99	2.5422e-003	9.4061e+007	5.3866e-004	1.9930e+001
U-233	8.3959e-005	3.1065e+006	1.7790e-005	6.5823e-001
U-234	1.3112e-002	4.8516e+008	2.7784e-003	1.0280e+002
U-235	4.1812e-004	1.5471e+007	8.8596e-005	3.2780e+000
U-236	5.3353e-005	1.9740e+006	1.1305e-005	4.1828e-001
U-238	9.1151e-005	3.3726e+006	1.9314e-005	7.1461e-001
Y-90	3.3450e+001	1.2376e+012	7.0876e+000	2.6224e+005

**Buildup : The material reference is - Air Gap
Integration Parameters**

X Direction	10
Y Direction	20
Z Direction	40

Results - Dose Point # 1 - (400.5625,228,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	1.754e-318	1.702e-25	1.504e-319	1.460e-26
0.02	3.426e+07	1.411e-146	1.328e-27	4.886e-148	4.599e-29
0.03	6.517e+10	7.153e-46	4.789e-23	7.089e-48	4.746e-25
0.04	1.538e+10	6.867e-21	1.688e-18	3.037e-23	7.466e-21
0.05	8.827e+05	1.509e-15	6.343e-13	4.021e-18	1.690e-15
0.06	5.380e+07	2.257e-09	8.600e-07	4.484e-12	1.708e-09
0.08	4.603e+06	9.055e-07	1.616e-04	1.433e-09	2.558e-07
0.1	8.086e+06	4.105e-05	3.522e-03	6.281e-08	5.388e-06
0.15	2.454e+06	2.100e-04	5.897e-03	3.457e-07	9.711e-06
0.2	1.135e+07	2.715e-03	4.425e-02	4.791e-06	7.810e-05
0.3	1.915e+06	1.257e-03	1.177e-02	2.385e-06	2.234e-05
0.4	4.694e+07	5.631e-02	3.855e-01	1.097e-04	7.512e-04
0.6	9.956e+11	2.638e+03	1.244e+04	5.150e+00	2.428e+01
0.8	4.727e+07	2.155e-01	8.074e-01	4.100e-04	1.536e-03
1.0	5.514e+09	3.804e+01	1.217e+02	7.013e-02	2.244e-01
1.5	5.514e+09	7.895e+01	1.968e+02	1.328e-01	3.311e-01
Totals	1.100e+12	2.756e+03	1.276e+04	5.353e+00	2.484e+01

Results - Dose Point # 2 - (400.5625,120,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	7.677e-291	2.044e-25	6.585e-292	1.753e-26
0.02	3.426e+07	6.109e-134	1.594e-27	2.116e-135	5.522e-29

0.03	6.517e+10	9.625e-42	5.749e-23	9.539e-44	5.698e-25
0.04	1.538e+10	4.854e-19	1.039e-16	2.147e-21	4.594e-19
0.05	8.827e+05	1.432e-14	4.980e-12	3.815e-17	1.327e-14
0.06	5.380e+07	8.627e-09	2.697e-06	1.714e-11	5.357e-09
0.08	4.603e+06	1.666e-06	2.483e-04	2.637e-09	3.930e-07
0.1	8.086e+06	5.820e-05	4.260e-03	8.903e-08	6.518e-06
0.15	2.454e+06	2.442e-04	6.113e-03	4.021e-07	1.007e-05
0.2	1.135e+07	2.989e-03	4.452e-02	5.275e-06	7.857e-05
0.3	1.915e+06	1.332e-03	1.170e-02	2.526e-06	2.219e-05
0.4	4.694e+07	5.867e-02	3.823e-01	1.143e-04	7.449e-04
0.6	9.956e+11	2.704e+03	1.236e+04	5.277e+00	2.412e+01
0.8	4.727e+07	2.190e-01	8.049e-01	4.166e-04	1.531e-03
1.0	5.514e+09	3.848e+01	1.218e+02	7.094e-02	2.246e-01
1.5	5.514e+09	7.959e+01	1.990e+02	1.339e-01	3.348e-01
Totals	1.100e+12	2.822e+03	1.268e+04	5.482e+00	2.468e+01

Results - Dose Point # 3 - (400.5625,60,300) in

Energy MeV	Activity Photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.246e+10	3.431e-284	2.165e-25	2.943e-285	1.857e-26
0.02	3.426e+07	8.282e-131	1.689e-27	2.869e-132	5.849e-29
0.03	6.517e+10	1.352e-40	6.090e-23	1.340e-42	6.036e-25
0.04	1.538e+10	1.471e-18	3.007e-16	6.507e-21	1.330e-18
0.05	8.827e+05	2.364e-14	7.745e-12	6.297e-17	2.063e-14
0.06	5.380e+07	1.084e-08	3.189e-06	2.154e-11	6.334e-09
0.08	4.603e+06	1.687e-06	2.386e-04	2.670e-09	3.776e-07
0.1	8.086e+06	5.465e-05	3.835e-03	8.361e-08	5.868e-06
0.15	2.454e+06	2.170e-04	5.316e-03	3.573e-07	8.755e-06
0.2	1.135e+07	2.619e-03	3.861e-02	4.623e-06	6.815e-05
0.3	1.915e+06	1.158e-03	1.018e-02	2.197e-06	1.930e-05
0.4	4.694e+07	5.091e-02	3.338e-01	9.919e-05	6.505e-04
0.6	9.956e+11	2.346e+03	1.087e+04	4.580e+00	2.121e+01
0.8	4.727e+07	1.905e-01	7.123e-01	3.623e-04	1.355e-03
1.0	5.514e+09	3.356e+01	1.084e+02	6.186e-02	1.999e-01
1.5	5.514e+09	6.996e+01	1.794e+02	1.177e-01	3.018e-01
Totals	1.100e+12	2.450e+03	1.116e+04	4.760e+00	2.171e+01

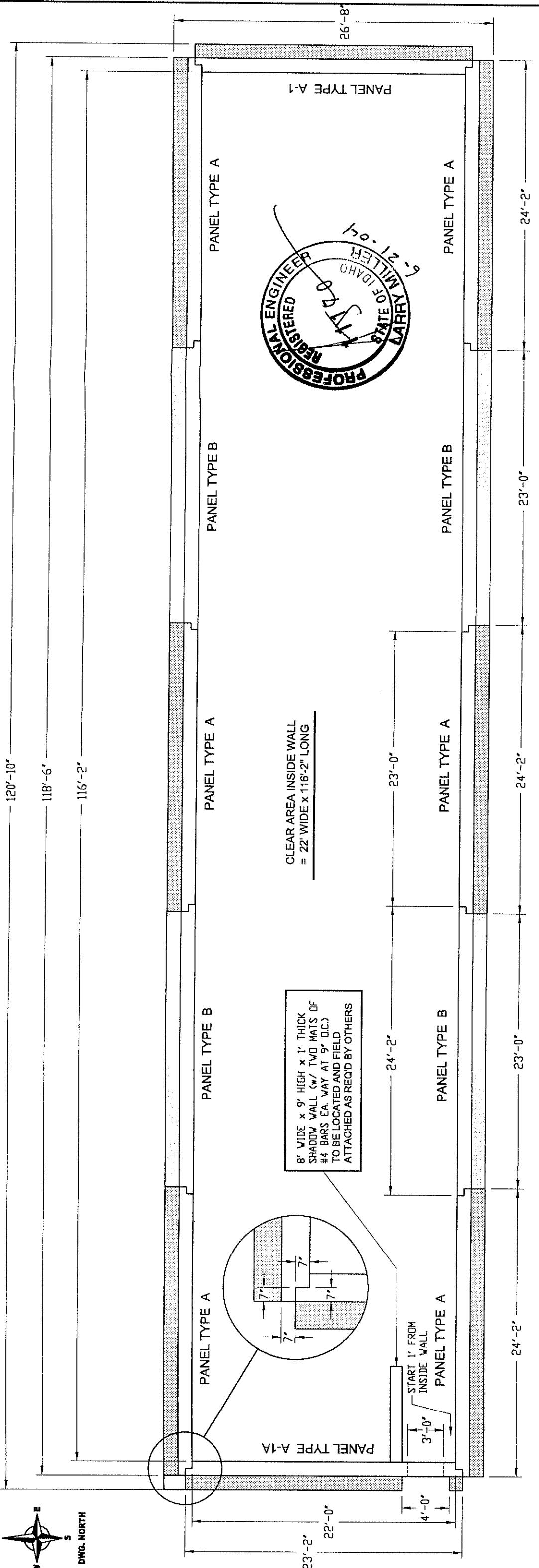
TEM-0104
03/30/2004
Rev. 0

ENGINEERING DESIGN FILE

PEI-EDF- 1005
Rev. I
Page 45 of 51

Attachment 2

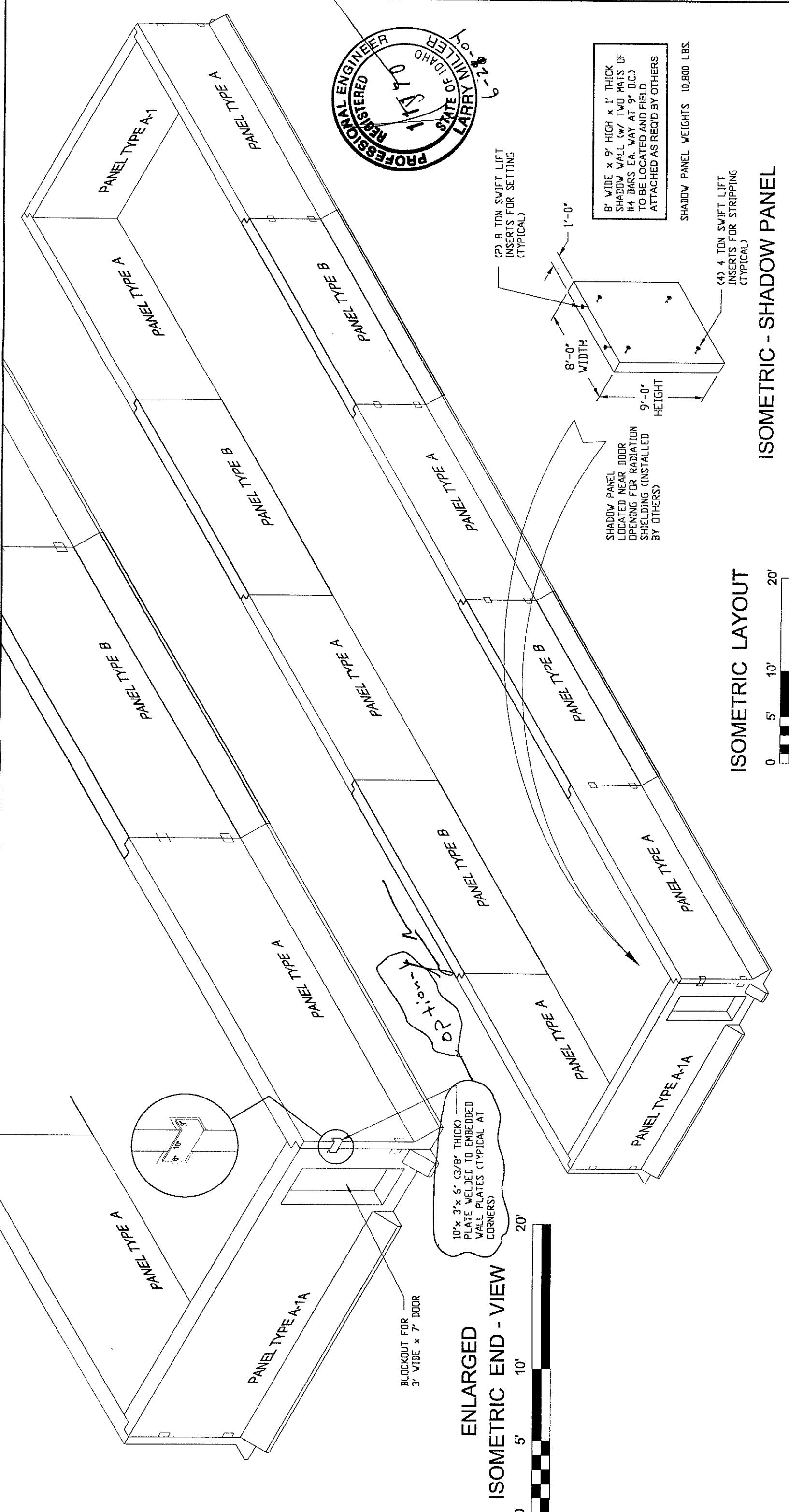
Concrete Radiation Barrier Wall Drawings



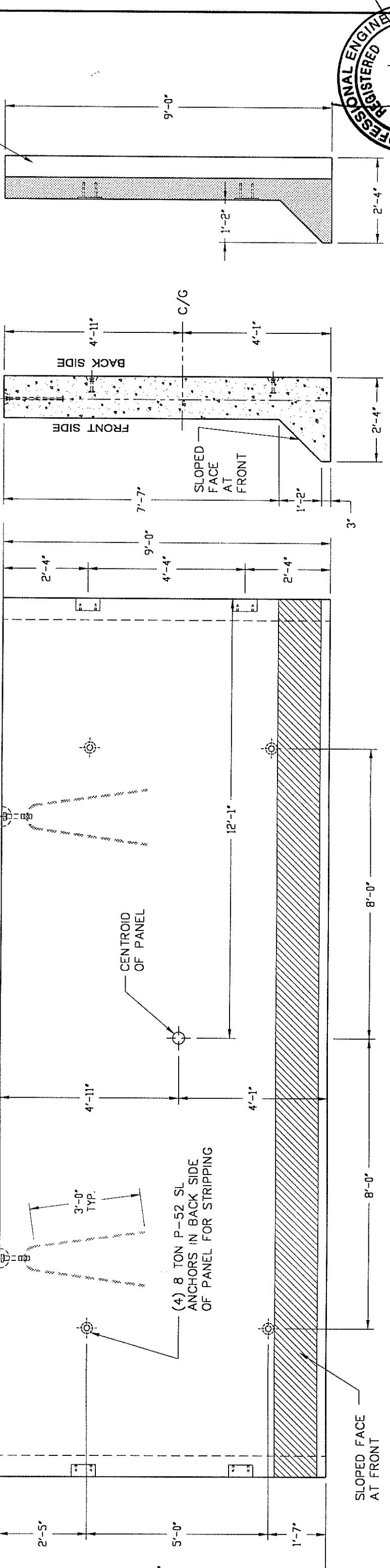
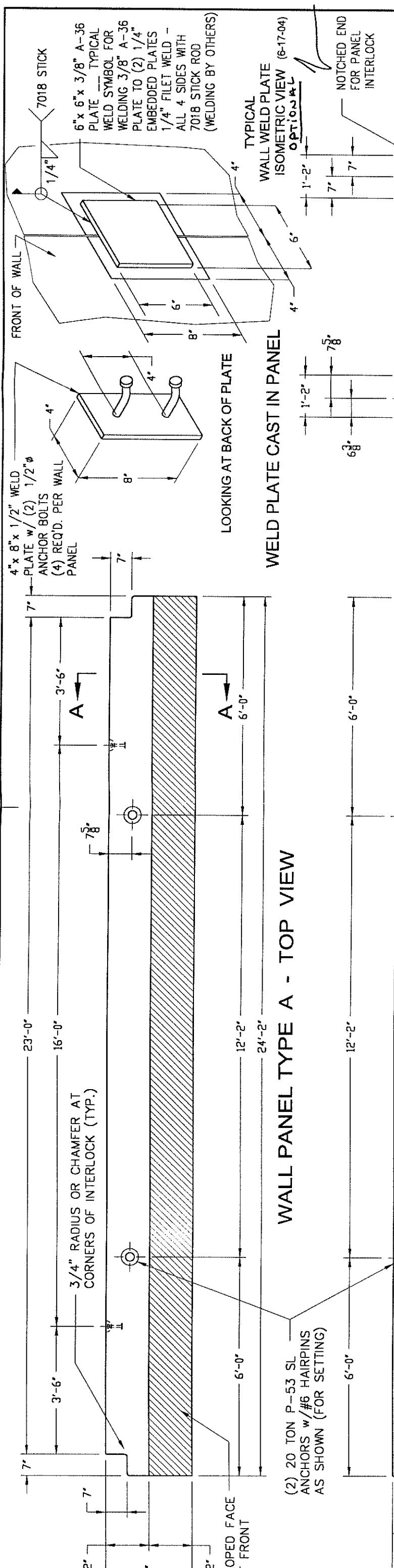
LAYOUT - PLAN VIEW

RADIATION BARRIER WALL - ELEVATION

QUALITY CONTROL:		GENERAL DESIGN CRITERIA:		PROJECT: INEEL	
<input type="checkbox"/> REPLACEMENT CHECKS: <input type="checkbox"/> FORM CONDITION, CLEANLINESS <input type="checkbox"/> FORM SET-UP AND DIMENSIONS <input type="checkbox"/> LIFTING DEVICES <input type="checkbox"/> STEEL-SIZE, SPACING, CLEARANCE <input type="checkbox"/> BLOCKOUTS, KNOCKOUTS <input type="checkbox"/> TIES & CHAIRS		<input type="checkbox"/> POSTPLACEMENT CHECKS: <input type="checkbox"/> INSERTS, HOLE SIZE & LOCATION <input type="checkbox"/> BURGHOLDS, PORELINES, HONEYCOMBING <input type="checkbox"/> ROCK POCKETS, EXPOSED STEEL <input type="checkbox"/> POUR DATE, MARKING, STENCILING <input type="checkbox"/> FINISHING, TRUVELING <input type="checkbox"/> DIMENSIONS, SQUARENESS		CONCRETE STRENGTH (28-DAY) Min. — 4,500 PSI STEEL YIELD STRENGTH — 60,000 PSI	
				PROJECT CONTRACTOR: PORTAGE ENVIRONMENTAL	
				MODIFIED LAYOUT PER CONTRACTOR 6-4-04	
		<input type="checkbox"/> APPROX. WEIGHTS:		SOLD BY: JEREMY S.O. NO.:	
		PANEL TYPE A — 40,670 Lbs PANEL TYPE A-1 — 38,950 Lbs PANEL TYPE A-1A — 34,690 Lbs PANEL TYPE B — 40,480 Lbs		DRAWN BY: <i>JED</i> SCALE: NONE DATE: 5-27-04 FILE NO.:	
		GENERAL NOTES: TOLERANCE DIMENSIONS TO BE WITHIN ASTM C588 GUIDE LINES (NOTE: 0' to 5 $\frac{1}{2}$ " ± 1 $\frac{1}{4}$ ", 5' to 10 $\frac{1}{2}$ " ± 3 $\frac{1}{8}$ ", 10' to 20 $\frac{1}{2}$ " ± 1 $\frac{1}{4}$ " Reinforcement ± 1 $\frac{1}{4}$ " of design & never less than 3 $\frac{1}{4}$ " clear, Wall & slab thickness not less than design by more than 5% or 3 $\frac{1}{2}$ " whichever is greater)		THIS DOCUMENT IS THE PROPERTY OF AMCOR INC. IT IS SUBMITTED FOR REFERENCE PURPOSES ONLY AND SHALL NOT BE USED IN ANY WAY INJURIOUS TO THE INTERESTS OF SAID COMPANY.	
				P.O. BOX 51418 IDAHO FALLS, ID 83405 (208) 522-6150 (800) 988-2240 • FAX (208) 522-9701	
				DRAWING MP1084 DATE CHK'D: <i>6/21</i> DWG. 1 OF 6	
				NAME: <i>[Signature]</i>	



QUALITY CONTROL:		POSTPLACEMENT CHECKS:	
<input type="checkbox"/> PREREPLACEMENT CHECKS:		<input type="checkbox"/> FORM CONDITION CLEANLINESS	<input type="checkbox"/> INSERTS, HOLE SIZE & LOCATION
		<input type="checkbox"/> FORM SET-UP AND DIMENSIONS	<input type="checkbox"/> BUSHHOLES, POULINES, HONEYCOMBING
		<input type="checkbox"/> LIFTING DEVICES	<input type="checkbox"/> ROCK POCKETS, EXPOSED STEEL,
		<input type="checkbox"/> STEEL SIZE, SPACING, CLEARANCE	<input type="checkbox"/> POUR DATE, MARING, STENCILING
		<input type="checkbox"/> BLOCKOUTS, KNOCKOUTS	<input type="checkbox"/> FINISHING, TROWELING
		<input type="checkbox"/> TIES & CHARS	<input type="checkbox"/> DIMENSIONS, SQUARENESS
		CLEARANCE DIMENSIONS TO BE WITHIN ASTM C338 GUIDE LINES (NOTE: 0' to 5'-0" 1/4", 5' to 10'-0"± 1/4", 10' to 20'-0"± 1/2"	
		Reinforcement ± 1/4" of design & never less than 3/4" clear, Wall and slab thickness not less than design by more than 5% or 3/16" whichever is greater)	
GENERAL NOTES:		<ol style="list-style-type: none"> OWNER/CONTRACTOR TO VERIFY DIMENSIONS & INFORMATION SHOWN & FURNISH ADDITIONAL DIMENSIONS OR INFORMATION REQUIRED. CONTRACTOR IS RESPONSIBLE FOR PROVIDING & INSTALLING ITEMS NOT SHOWN AS PART OF THESE DRAWINGS, INCLUDING GROUTING. 	
PROJECT: INEEL		PROJECT CONTRACTOR: PORTAGE ENVIRONMENTAL	
# REV. DATE		MODIFIED LAYOUT PER CONTRACTOR 6-4-04	
		SOLD BY: JEREMY	S.O. NO.:
		DRAWN BY: <i>zed</i>	SCALE: NONE
		DATE: <i>5-27-04</i>	FILE NO.:
		CHK'D. BY: <i>h</i>	DATE CHK'D.: <i>6/21</i>
AMCOR Precast® CONCRETE RADIATION BARRIER UTILITY WALLS & SHADOW PANEL ISOMETRIC LAYOUTS			
oldcastle Precast, Inc. A DIVISION OF			
P.O. BOX 51418 IDAHO FALLS, ID 83405 (208) 522-6150 • (800) 988-2240 • FAX (208) 522-9701 DRAWING NAME: MP1084 Dwg. 2 of 6 SHEET			



(6) TYPE A PANELS REQ'D

WALL PANEL TYPE A - FRONT ELEVATION

SECTION A-A

FRON & WALL FINISHES
TO BE FORM FINISH -- BACK
SIDE TO RECEIVE FLOAT OR
TROWELED FINISH

SECTION A-A ENI
9' HIGH x 2'-4" WIDE x 24' LONG
CONCRETE RADIATION BARRIER

C-17-34			C-17-34 WELD PLATE INFORMATION		PROJECT CONTRACTOR:		PORTAGE ENVIRONMENTAL		
#	REV. DATE	REVISION DESCRIPTION						MODIFIED LAYOUT PER CONTRACTOR 6-4-04	
APPROX. WEIGHTS:		SOLD BY:	JEREMY	S.O. NO.:					
PANEL TYPE A	—	40,670	Lbs	DRAWN BY:	<u>340</u>	SCALE:	NONE		
PANEL TYPE A-1	—	38,950	Lbs	DATE:	<u>5-27-04</u>	FILE NO.:			
PANEL TYPE A-1A	—	34,690	Lbs	CHK'D BY:		DATE CHK'D:	<u>6/21</u>		
PANEL TYPE B	—	40,480	Lbs						

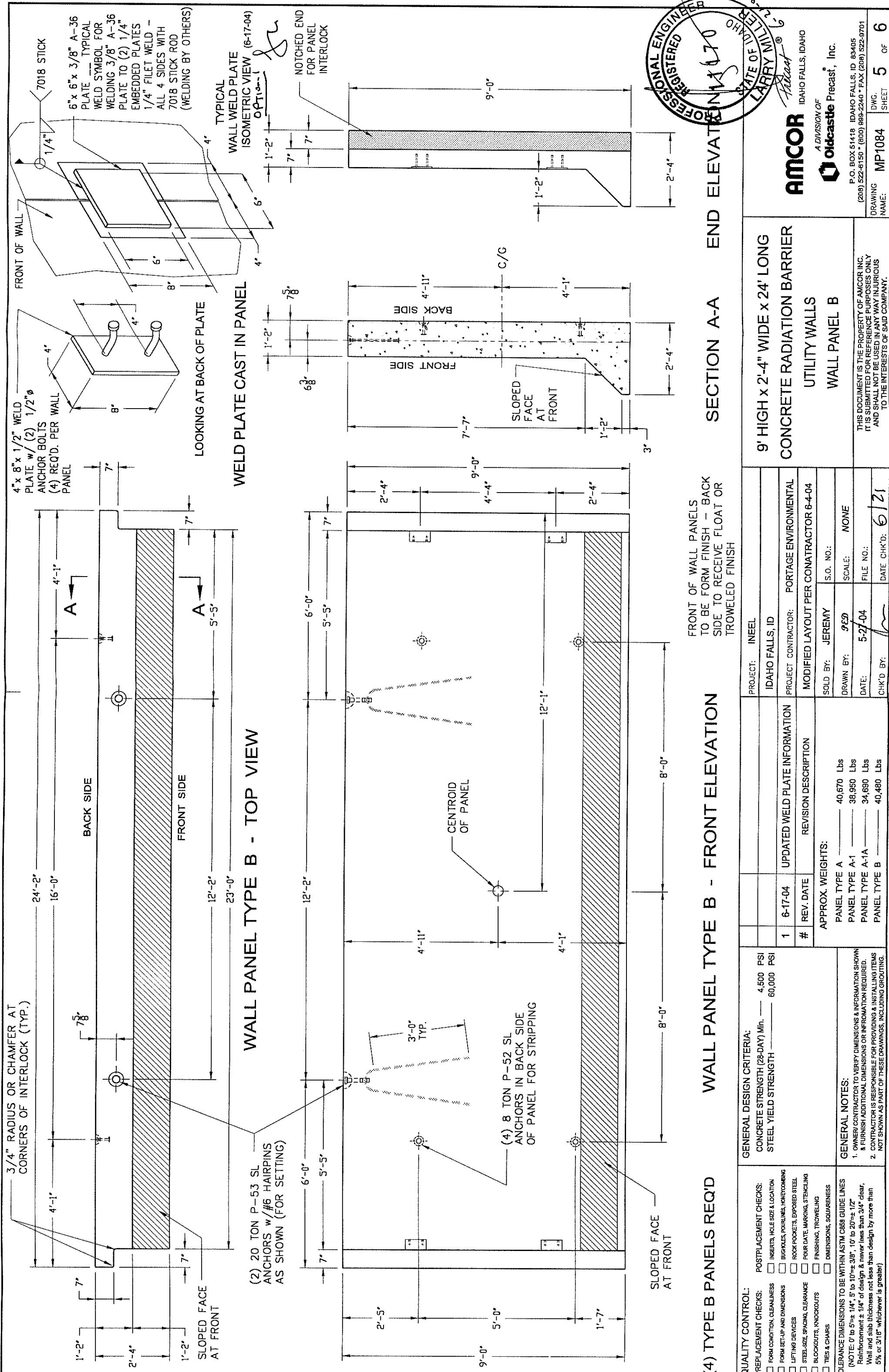
<input type="checkbox"/> LIFTING DEVICES <input type="checkbox"/> ROCK POCKETS, EXPOSED STEEL <input type="checkbox"/> STEEL SIZE, SPACING, CLEARANCE <input type="checkbox"/> BLOCKOUTS, KNOCKOUTS <input type="checkbox"/> TIES & CHAIRS	<input type="checkbox"/> FOUR DATE, MARKING, STECULINE <input type="checkbox"/> FINISHING, TROWELING <input type="checkbox"/> DIMENSIONS, SQUARENESS	GENERAL NOTES: CLEARENCE DIMENSIONS TO BE WITHIN ASTM C568 GUIDE LINES (NOTE: 0' to $5\frac{1}{4}$ " - 5" to $10\frac{1}{2}$ " - $3\frac{1}{8}$ " - 10' to $20\frac{1}{2}$ " to $1\frac{1}{2}$ ") Reinforcement $\pm 1/4$ " of design & never less than 3/4" clear, Wall and slab thickness not less than design by more than 5% or $31\frac{1}{8}$ " whichever is greater)
1. OWNER/CONTRACTOR TO VERIFY DIMENSIONS & INFORMATION SHOWN & FURNISH ADDITIONAL DIMENSIONS OR INFORMATION REQUIRED. 2. CONTRACTOR IS RESPONSIBLE FOR PROVIDING & INSTALLING ITEMS NOT SHOWN AS PART OF THESE DRAWINGS, INCLUDING GROUTING.		

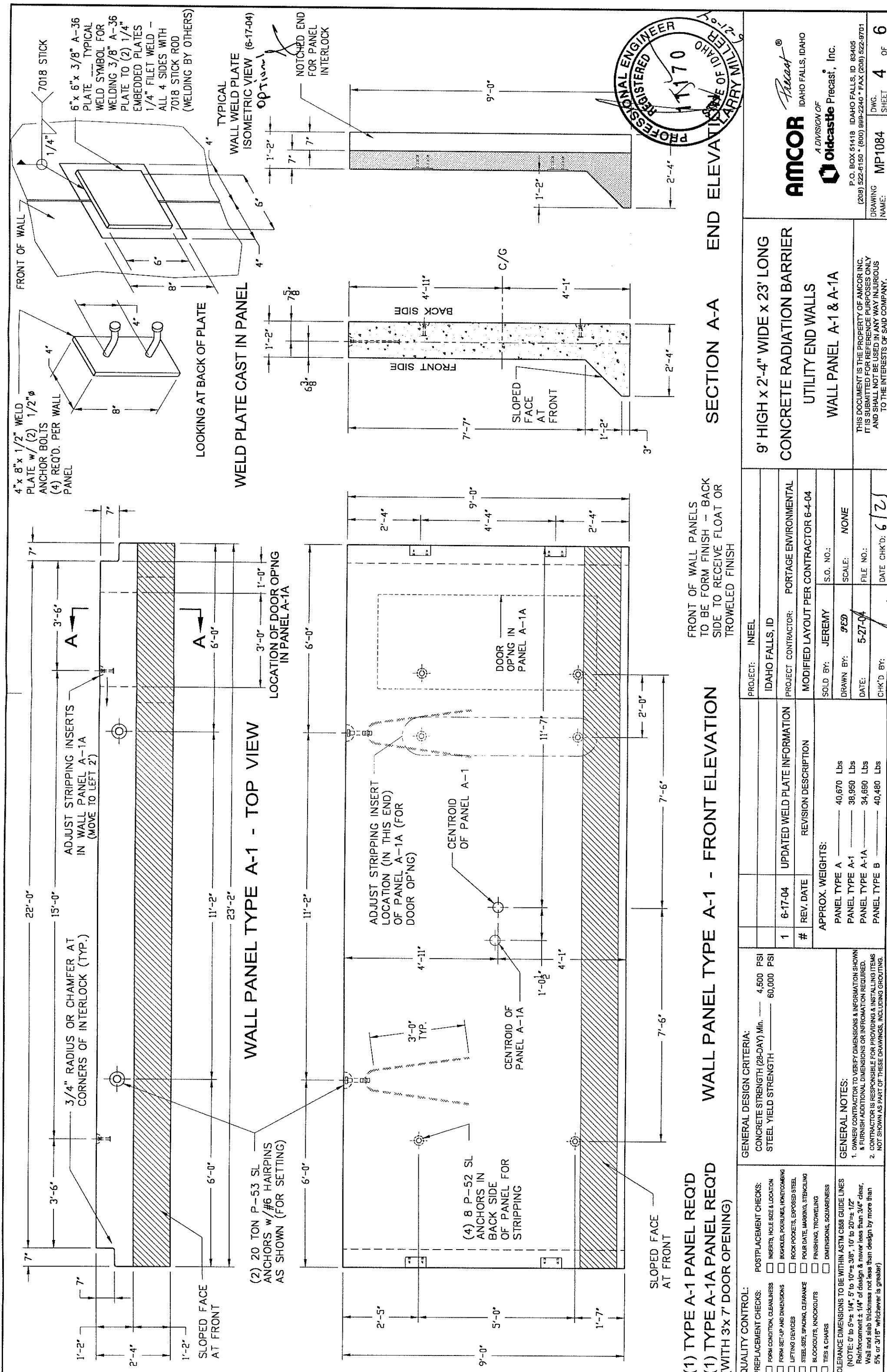
LARRY MILL

Hearst®
IDAHO FALLS, IDAHO

Oldcastle Precast[®], Inc.
A DIVISION OF

P.O. BOX 51418 IDAHO FALLS, ID 83405
NC 522-6150 • (800) 888-2240 * FAX (208) 522-
MP1084 DWG. SHEET 3 OF





PROVIDE ADDITIONAL #8 BARS EACH SIDE & AT TOP & BTM.
OF DOOR OPENING (IN EACH FACE) EXTEND 9" BEYOND OPENING
MIN. (ON TOP AND BOTTOM BARS EXTEND 48" BEYOND 48"
ON LONG SIDE)

ADDITIONAL REBAR AROUND OPENING
DOOR OPENING

9'-0"

(24) #5 AT
12" O.C. 12"

2" CLR.

24"

This technical drawing illustrates a structural frame section, likely a girder or beam, with various dimensions and bolt details. The main structure is a rectangular box with a height of 2'-4" and a width of 1'-2". The top flange has a thickness of 12" O.C. and contains 24 #5 bolts spaced at 12" O.C. A 2" CLR is indicated between the top flange and the top chord. The bottom flange has a thickness of 12" O.C. and contains 18 #5 bolts spaced at 8" O.C. A 2" CLR is indicated between the bottom flange and the bottom chord. The side webs have a thickness of 12" O.C. and contain 48 #5 bolts spaced at 8" O.C. A 2" CLR is indicated between the side webs and the side chords. The top chord has a thickness of 12" O.C. and contains 24 #5 bolts spaced at 12" O.C. A 2" CLR is indicated between the top chord and the top flange. The bottom chord has a thickness of 12" O.C. and contains 24 #5 bolts spaced at 12" O.C. A 2" CLR is indicated between the bottom chord and the bottom flange. The side chords have a thickness of 12" O.C. and contain 24 #5 bolts spaced at 12" O.C. A 2" CLR is indicated between the side chords and the side webs.

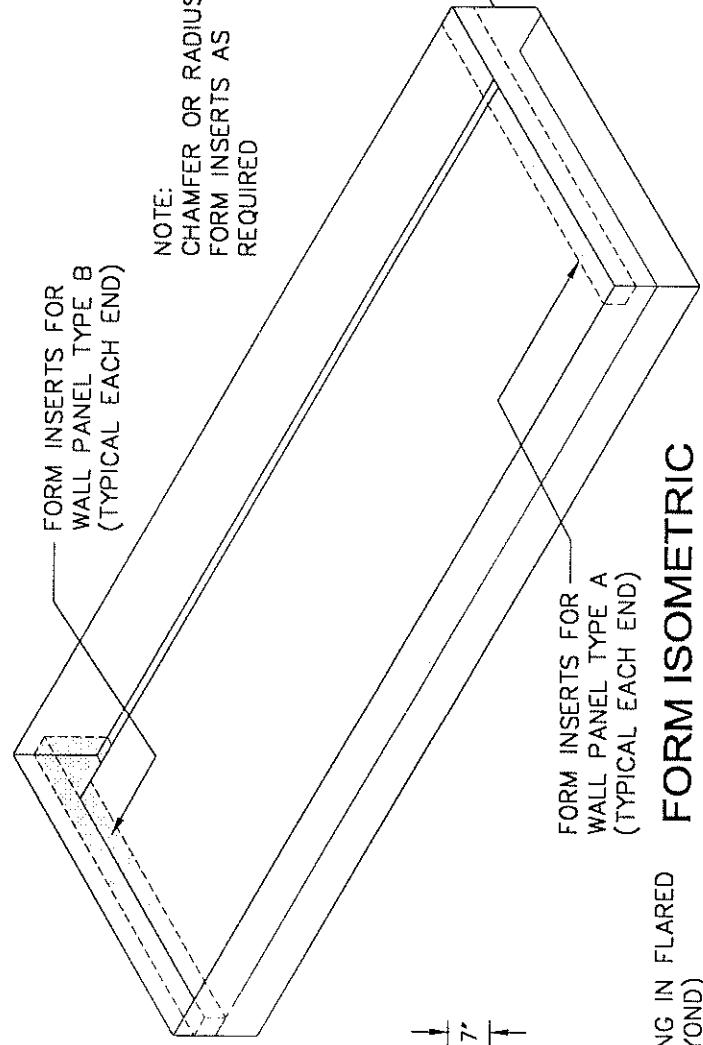
ADJUST REINFORCING AS
REQUIRED FOR NOTCHES
IN PANELS TYPE A & B

• — • — • — • — • —

(S) #3 CNTL.
AT BTM.
(23'-8" LNG)

1055 LBS. OF #5 REBAR
175 LBS. #8 AT DOOR OP'NG

SECTION A-A (IN FORM) SHOWING TYPICAL REINFORCING



NOTE:
CHAMFER OR RADIUS
FORM INSERTS AS
REQUIRED

Recast®
IDAH0 FALLS, IDAHO

(2)

This is an architectural foundation plan. The vertical axis is labeled "24'-2"" and the horizontal axis is labeled "0'-0" at the bottom right. A north arrow labeled "A" is located in the upper left corner. A circular stamp in the center-right area contains the following text:
PROFESSIONAL
REGISTERED
ENGINEER
STATE OF IDAHO
MILLER, DALE
ID 100-64

BACK SIDE OF WALL PANEL (IN FORM)
LOOKING DOWN AT FORM

FORM INSERTS AS REQ'D
FOR PANEL TYPE A & B
(TYPICAL EACH END)

FORM INSERTS FOR
WALL PANEL TYPE B
(TYPICAL EACH END)

REBAR - SEE
SECTION A-A

7' CLR.

7' 7' 7'

A-A

SECTION B-B (SHOWING FORM INSERTS FOR (SHOWING TYPICAL REINFORCING LAYOUT)

FORM ISOMETRIC

**9' HIGH x 2'-4" WIDE x 24' LONG
CONCRETE RADIATION BARRIER**

UTILITY WALLS

9, H
CON

P.O. BOX 51418 IDAHO FALLS, ID 83405
(208) 522-6150 • (800) 899-2240 * FAX (208) 522-9701

(2)

QUALITY CONTROL:		GENERAL NOTES:	
PREPLACEMENT CHECKS:		1. OWNER CONTRACTOR TO VERIFY DIMENSIONS & INFORMATION SHOWN & FURNISH ADDITIONAL DIMENSIONS OR INFORMATION REQUIRED. 2. CONTRACTOR IS RESPONSIBLE FOR PROVIDING & INSTALLING ITEMS NOT SHOWN AS PART OF THESE DRAWINGS, INCLUDING GROUTING.	
POSTPLACEMENT CHECKS:	POSTPLACEMENT CHECKS:	#	REV. DATE
FORM CONDITION, CLEANLINESS	<input type="checkbox"/> FORM CONDITION, CLEANLINESS	REVISION DESCRIPTION	
FORM SET-UP AND DIMENSIONS	<input type="checkbox"/> FORM SET-UP AND DIMENSIONS	MODIFIED LAYOUT PER CONTRACTOR 6-4-04	
LIFTING DEVICES	<input type="checkbox"/> LIFTING DEVICES	SOLD BY:	JEREMY
STEEL SIZE, SPACING, CLEARANCE	<input type="checkbox"/> STEEL SIZE, SPACING, CLEARANCE	S.O. NO.:	
BLOCKOUTS, KNOCKOUTS	<input type="checkbox"/> BLOCKOUTS, KNOCKOUTS	DRAWN BY:	<i>JED</i>
TIES & CHAIRS	<input type="checkbox"/> TIES & CHAIRS	SCALE:	NONE
TOLERANCE DIMENSIONS TO BE WITHIN ASTM C888 GUIDE LINES (NOTE: 0' to 5' = 1/4", 5' to 10' = 3/8", 10' to 20' = 1/2" Reinforcement $\pm 1/4"$ of design & never less than 3/4" clear, Wall and slab thickness not less than design by more than 5% or 3/16" whichever is greater.)		GENERAL NOTES:	
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		DRAWING NAME:	MP1084
		DWG. SURF:	6
		CHK'D BY:	<i>6/2</i>
		DATE CHK'D:	
		FILE NO.:	
		DATE:	<i>5-27-04</i>